CONSEIL PERMANENT INTERNATIONAL POUR
L'EXPLORATION DE LA MER
CHARLOTTENLUND SLOT – DANEMARK

RAPPORTS

ET

PROCÈS-VERBAUX DES RÉUNIONS

VOLUME CXV – EDITION ANGLAISE

INTERNATIONAL EXPLORATION OF THE SEA

BY

JOHAN HJORT

THE STOCK OF SEA FISHES AND THE INTERNATIONAL CONVENTION LONDON, 1937

BY

HENRY BAELS

EN COMMISSION CHEZ
ANDR. FRED. HØST & FILS
COPENHAGUE

1945

TABLE OF CONTENTS

	Page
Johan Hjort: International Exploration of the Sea	3—19
Henry Baels: The Stock of Sea Fishes and the International Convention London, 1937	21—51

INTERNATIONAL EXPLORATION OF THE SEA

BY

JOHAN HJORT

PREFATORY NOTE

DURING forty years of co-operation the northern European countries have gained valuable knowledge of the sea and its world of living organisms. Their chief aim throughout these years has been to study the varying conditions under which the human workers of the sea carry on their struggle for existence in the common international field of work. In the early years science was able to assist the fishing industry by discovering new fishing grounds and devising new fishing methods. In localities, however, where the stock of fish on the old grounds was unable to bear any intensification of the fishing it became the task of science to help in devising a plan for safeguarding lasting and economic fishing. The experience gained during the Great War (1914—18) united opinions so strongly that in 1937 all the governments of northern Europe came to an agreement regarding common international rules for co-operation between the various countries.

Since 1940 science has again been called upon to strengthen the foundation of experience upon which this agreement rested. As far as conditions permitted attempts were made to set on foot new investigations for this purpose. When the war is over it will be very important to renew the international agreements which are no longer in force.

In view of this the present short survey of the ideas, problems and results of the International Council for the Exploration of the Sea has been written. It has been published in Swedish as a contribution to the important work by Dr. K. A. Andersson, the Swedish marine biologist, on fishes and fishing in Scandinavia[1]). With his consent and acting upon the suggestion of various old colleagues it is here, without essential changes, placed at the disposal of the International Council in the hope that it may help to the renewal of its work.

July 1943.

Johan Hjort.

[1]) K. A. Andersson: Fiskar och Fiske i Norden. Natur och Kultur, Stockholm, 1942.

1. From Individual Enterprise to International Organisation.

OCEANOGRAPHY is one of our most modern sciences. This applies to purely theoretical as well as to experimental and practical exploration of the sea. While agriculture, forestry and the technical sciences in general have for generations been of the greatest practical importance for the work of mankind, marine research has only recently progressed to a point where it is able to yield information of value for the practical work at sea.

It is obvious that oceanography had to follow such a course of development. While on land science, at all events in many of its branches, may be carried on with the support of interested private persons, who, quite independently and impelled by a purely idealistic inclination for research, have for many years past been making valuable contributions to our common knowledge, at sea scientific activity is a vast and expensive enterprise, demanding a unique and rare combination of personal qualities in those who undertake this work.

Only in the countries where the sea forms bays, fiords, sounds and skerries affording shelter for work with small boats, as in the Scandinavian countries, was it possible for individual scientists to explore the sea on their own initiative and on their own account. Among these we remember especially Sven Lovén, Michael Sars and Japetus Steenstrup. These minor undertakings resulted not only in interesting discoveries regarding the fauna of the sea, but aroused in seafaring nations so keen a curiosity about the unknown mysteries of the sea that in the course of the last century the governments commissioned special vessels, which were equipped for the sole purpose of marine research. Of special importance was the British "Challenger" Expedition, which from 1872 to 1876 traversed all the oceans. From the work of these expeditions was acquired the first information concerning the depths, currents etc. of the oceans, the physical properties of sea water, and the great multiplicity of living forms. All these facts seemed to the interested public in all countries like messages from an entirely new world. They greatly influenced the trend of thought based on the older sciences and on the phenomena of nature studied on land. Thus all the new knowledge of hitherto unknown plants and animals were of great importance for the systems of botany and zoology, as well as for the conception of the descent of organisms. The hypothesis arose that there still lived in the sea organisms closely related to the ancestors from which the flora and fauna of the continent were descended. In museums and laboratories in many countries biologists have for several decades been engaged intensively upon systematic studies of the vast new material.

But however necessary and important these expeditions might be for a preliminary survey of a hitherto unknown world, it was soon apparent that it was not possible, with short expeditions covering limited areas of the sea, to gain any information regarding all the variations from season to season and from year to year that are of such importance for a comprehension of the movements of water masses and marine life. Nor could these expeditions establish co-operation with the fishermen, sealers and whalers who did their work at sea. In order to be of service to these workers of the sea, investigations of an entirely different kind had to be organized enabling limited areas of the sea to be explored throughout the whole year, or for the greater part of it, in collaboration with the fishermen, sealers and whalers working in the same area. Investigations of this kind were started during the last decades of the past century on very modest lines, as pioneer work which had not yet received that support from the public which is obtainable only when science has succeeded in making such discoveries and inventions, in accumulating such knowledge and information, as may be expected to be of real consequence for the work of the people. At that juncture the scientists themselves naturally had to establish co-operation with each other. And it soon became evident that the study of the sea

offered many and important tasks for such international co-operation. Whereas at the beginning of the last century fisheries had been mainly coastal, during the course of the century a deep-sea fishery developed, first on the banks of the North Sea and the Skagerak, later on more distant coastal banks, round the Faroe Islands and Iceland, off the coast of northern Norway, and finally along the Atlantic coast of Europe and North Africa.

The international co-operation in North-European waters began on a very small scale and chiefly on the basis of personal friendship between scientists of the three Scandinavian countries. The aim of this collaboration was not only to extend the area of investigation from the Baltic Sea by way of the Skagerak to the west coast of Norway, but also to promote within the small circle of scientists an exchange of experiences regarding methods and problems, as no single investigator could be master of the greatly diversified problems arising in connection with the exploration of the sea.

It should be remembered, not only within the circle of those specially interested, but also in the general history of science, as an evidence of far-seeing forethought, that the Swedish government, at the instigation of H. M. King Oscar II showed, during the last years of the past century, its confidence in this unassuming collaboration by recognizing it as the first step towards a future international goal, and inviting all the countries of northern Europe to co-operate within a larger organization.

The invitation of the Swedish government was most cordially received in a number of countries and led to the initial discussion of the plans for the future international exploration of the sea at a conference held in Stockholm in 1899, when the following countries were represented: Denmark, Germany, Great Britain, Holland, Norway, Russia and Sweden. At this meeting a first draft programme of work was adopted. This was later amplified at a conference in Christiania in 1901, and finally in 1902 a constituent meeting was held in Copenhagen, where a central office for the administrative organization of the work was established. In the course of time this organization was joined, in addition to the countries already mentioned (except the U. S. S. R.), by Belgium, Finland, France, Iceland, the Irish Free State, Latvia, Poland and Spain: Canada, Esthonia, Italy, and Portugal were also for a short time members. The various events in foreign politics, which in every sphere have made all international projects in Europe hazardous, have also created great difficulties for collaboration in the field of marine research. Naturally the Great War of 1914—1918 was a very critical time for such collaboration, and in the present war it is again facing difficulties, the consequences of which cannot now (1943) be foreseen. But during all these years scientists from all countries have gone on working, at great personal sacrifice and with great energy, feeling that the task of founding and promoting international exploration of the sea is such a sound object, both for idealistic science and for practical work at sea, that it will be able to count on the continued co-operation of all nations in the future.

During its first years of work this organization had to concentrate especially on a preliminary survey and on problems of method, as a foundation for later theoretical and practical tasks. An outsider can perhaps most easily form an opinion of the necessity and scope of such preparatory work if he realizes what problems would arise if man, with his present thirst for knowledge and comprehension of nature, were suddenly faced with the discovery of an entirely new continent, the geography, climate, flora and fauna of which were completely unknown. It has been calculated that of the 510 million square kilometres constituting the surface of our planet 361 million are water and 149 million land. Like the continents, the surface of the sea extends over all latitudes, with consequent variations in the physical phenomena and in the conditions of life of the organisms. Besides the wide scope of the task we have the difficulties arising from the fact that the organic life beneath the surface of the sea is not accessible for direct observation but has to be studied with the help of specially constructed instruments and gear. For thousands of years the men who discovered the immense value of the sea for human enterprise, understood this and adjusted themselves accordingly. It was with their implements for navigation, hunting and fishing that marine exploration had to begin its work. But in the course of this work it soon became clear that there are forces and living organisms in the sea, which cannot come within the ken of those engaged in practical work. Thus the plants and animals that occur in the greatest numbers are never seen by whalers or fishermen. They cannot be caught with ordinary gear and are so small that they can only be studied with the microscope. This applies to a certain extent to the fishes, too. They start life as minute eggs about a millimetre in diameter, and grow through a sequence of characteristic stages into the small fishes that the fishermen know.

All these circumstances could only be revealed by a large number of scientists devoting their lives to the investigation of a small part of the immense area of exploration, and arranging their results so that they would be suitable for the use of others with new objectives. An enormous amount of work has been accomplished. Much literature dealing with the sea has been compiled, in which the scientist can find what he needs to know, almost as one looks up unknown words in a dictionary.

Obviously the work had from the very beginning to be sub-divided into various categories: thus several special sciences have arisen within the all-embracing exploration of the sea.

2. Hydrography or Physical Oceanography.

The object of this science is the study of the sea itself, the physics and chemistry of the water masses, the changes occurring in the sea at different times and the movements that from earliest times have been called the currents of the sea.

Previous to the large expeditions only the general trend of the temperature of the *surface water* was known. The salinity was known to be higher in the open oceans than in the coastal waters and gulfs, such as the Baltic, and the causes of ebb and flow were known. The old sailing vessels got to know the movements of the sea by the reckoning, which showed the leeway of the ship, with the current and counter-current at the surface.

As the expeditions made it their aim to acquire a knowledge of the sea in its entirety, from its surface to its greatest depth, the first task was to construct instruments that could collect "water samples" and examine the temperature at all depths. These instruments were called "water samplers" and "deep-sea thermometers". The examinations of the water samples collected consisted in the first place in a determination of the salinity (by specific weight determinations and chemical chlorine titrations). The expeditions thus imparted in broad outline the first knowledge of the temperature and salinity of the sea at all depths at the locality and time of the investigations. It became increasingly evident, however, that each observation of the kind could only be regarded as a "snapshot" in the changing multiplicity which the sea offers everywhere at different places and times.

It was therefore with a new object in view that the Swedish scientists Otto Pettersson and Gustaf Ekman explored a limited sea area, the Skagerak, at all seasons of the year. While the large expeditions had naturally directed all their attention to a preliminary survey and, consciously or unconsciously, had investigated the sea as though it were a static body of water, the interest in the case of observations often repeated in a smaller area was inevitably concentrated primarily on the movements of the sea (its dynamics). The knowledge gained of the great changes in the strong movements of the surface layer — the so-called Baltic current from the Baltic Sea and the Danish Sounds to the Skagerak and the south and west coasts of Norway — gav rise, as a logical necessity, to conceptions of reverse "compensatory" movements in the underlying water layers. The water samples confirmed the assumption of a distinct stratification in the Skagerak, and current measurements at different depths proved that the deeper layers represented currents from the North Sea and the northern Atlantic, bringing more saline water masses in under the Baltic surface current, where the sea water was greatly mixed with the river water discharged from the eastern part of northern Europe. Of great interest for future exploration of the sea was the discovery that not only were these various layers or currents characterized by their chemical and physical properties, but each of them formed the environment of living organisms different from each other, which also floated in them where the same water layers occurred at the surface. This was proved by collaboration between the hydrographers and biologists P. T. Cleve and C. W. S. Aurivillius.

Out of these experiences there next arose, however, the desire for a more extensive field of work, which might not only explain the condition of the Skagerak itself, but might also discover the connection between all the seas whose water masses interacted upon each other. Whoever has been engaged in studying the sea will understand how much truth there is in the old saying that "If a part of the sea moves, the entire sea moves". A complete, "absolute" comprehension of the movements of the sea is therefore an impossibility. It is true for all time that exploration of the sea must limit its work and realize this limitation. The men who initiated the first international co-operation in the early nineties were aware of this. They were scientists from Denmark and Norway, who joined their Swedish colleagues in an investigation of the area from the Baltic Sea and the Danish Sounds to the west coast of Norway. As this work gave rise to new and still greater problems, these greater tasks demanded not only a new organization for the collaboration of all northern European countries, but also a revision of the methods used. While the first oceanographers in their isolated work had to attend to all the varied tasks, hydrographical as well as biological, that arose, the larger organization could effect a division of labour between a number of specialists. In this way the methods gained in accuracy, and experience showed that the investigations thus secured a deeper understanding of the phenomena, and especially of the movements of the sea.

In the following years the work of the International Council for the Exploration of the Sea has resulted in a greater uniformity of the apparatus and research methods used. The deep-sea thermometers, water samplers and current meters now in use show marked progress as compared with the time preceding the international organization. Much work has been done in various countries and by international committees towards standardizing the chemical research methods. By the idea of comparing the chemical investigations of the sea area made by all countries in relation to one and the same water sample (normal water), an accuracy and conformity between the investigations of all countries has been reached, that was previously unattainable. This applies in the first place to the salinity determinations, but also to special methods for the determination of the chemical nutrient salts, such as phosphates, nitrates and the dissolved gases, on

which the presence of living organisms in the sea is dependent.

But a solution of the problem of accuracy in the methods used does not imply a solution of the vast problem of the organization of marine exploration. Experience has shown that the movements of the sea, the current velocities, fluctuate everywhere in a high degree. This applies both to land-locked waters like the Baltic and to the open sea. Accordingly, we must never lose sight of the fact that the investigations made only amount to an instantaneous photograph, as it were, of a given situation. In the hope of gradually arriving at an understanding of a general law governing "the condition of the sea" at various times and in the different areas, the first task undertaken has been a painstaking attempt to collect all the series of observations available and arrange them according to uniform methods in annual "hydrographic bulletins". But during all these years it has been evident that this can only be regarded as a preliminary to a future scientific understanding of the great causes of the movements of the sea and the changes they show from season to season and from year to year. Even to-day one can only give examples showing that it has been possible in certain circumstances to arrive at the detection of a law which is the object of our labours.

A good example is provided by the investigations, renewed in recent years, on the Baltic current. Along the entire stretch from the Baltic to the North Sea this north-going current proves to be intermixed with the under-current flowing from the North Sea to the Baltic. Everywhere the intensity of flow per month of the Baltic current exceeds on an average by 40 km.^{3} that of the under-current moving in the opposite direction. At its exit from the Baltic Sea proper the intensity of flow of the Baltic current is about 80 km.^{3} per month, but on leaving the Kattegat it has increased to about 220 km.^{3} per month. This increase is mainly due to intermixture of water from the under-current. In the open sea, too, intermixture phenomena are of consequence, and there one can often distinguish the existing sea water types from each other in cases where a water layer shows a characteristic temperature and salinity value. Thus there is a large area of sea to the west of Ireland, where the temperature of the water is 10·2° C and the salinity 35·45 $^0/_{00}$. By these two properties this water stratum can be traced through the Faroe-Shetland channel along the coast of Norway and into the Barents Sea. But in the Barents Sea, at longitude 30° E., there is not more than 20 $^0/_0$ of this kind of water in the place where it is most conspicuous.

With current meters of different types it is possible to determine the direction and velocity of the current both at the surface and in the depths, and this method has been much used, especially in studying the tidal movements in the depths. It would be impossible, however, to investigate for instance the Atlantic current (the Gulf Stream) in this manner alone. An attempt has been made to understand the phenomena there by studying and comparing a series of cross sections of the current by a (hydrodynamic) method, worked out in the first place by H. Mohn and V. Bjerknes, which is based on the observed data of the salinity and temperature of the sea water. Throughout many years much international work has been done to find an explanation of the inflow of water through the Faroe-Shetland channel into the northern sea between the coasts of Greenland and northern Norway. The extensive material resulting from this work is due partly to Danish expeditions, whose observations have been set forth in papers by Martin Knudsen (1911) and J. P. Jacobsen and Aage J. C. Jensen (1926); partly to Norwegian expeditions, whose materiel has been described by B. Helland-Hansen and F. Nansen (1909); and partly to the investigations of Scottish expeditions worked up by A. J. Robertson (1907 and 1913) and John B. Tait (1930 and 1934). In the survey which has been worked up by the hydrographic staff of the International Council under the leadership of Martin Knudsen and J. P. Jacobsen on the basis of this extensive material, collected in the course of many years' investigations, it appears that an average of 12 km.^{3} of water passes through the Faroe-Shetland channel per hour, and of this the previously mentioned layer of water characterized by a temperature of 10·2° C and a salinity of 35·45 $^0/_{00}$ constitutes approximately half. The intensity of flow of this current is about 100 times as great as that of the Baltic current at the point where it leaves the Baltic, but on the other hand it is so small in quantity that it would take three years to replace the water of the whole of the Norwegian Sea by the inflow of this Atlantic water through the Faroe-Shetland channel.

Calculations of this kind are undoubtedly of great value in any case as a contribution to the attempt to understand the changes of the sea, but the nature of the method implies that it is based on greatly simplified assumptions, and large though the material is, it is hardly sufficient for a final understanding of the problem. As already mentioned, the changes are everywhere subject to very great fluctuations, and no expedition can at one and the same time investigate the vast sea area in its entirety. The material only constitutes an average of observations made at various times during the course of many years.

It is, therefore, still an open question whether it will be possible to organize investigations able to provide a reasonable explanation of the great variations that biologists and fishermen have observed in fauna and flora, particularly in the border zones between Atlantic water and Polar water. The currents in the transitional zone between the Atlantic and the Norwegian Sea calculated on the basis of the

distribution of temperature and salinity according to Bjerknes are not the only ones and not in all cases the decisive ones. The hydrographers themselves point out that the circulation of the air, the currents of warm and cold air, and the intermixture conditions of Atlantic and Polar waters, must be taken into account in explaining the great changes in animal life demonstrated over long periods, by Adolf S. Jensen in the case of the Greenland Sea and by Norwegian fishing experiments in the sea off Spitsbergen, as will be related in greater detail below.

3. Production of the Sea.

In the sphere of agriculture it has been known for thousands of years that the plants formed the basis of all animal life on the face of the earth, but not until about 50 or 60 years ago did the same ideas occur as scientific problems regarding the organisms in the sea. Plants in the sea were originally known only as "seaweed" or "sea-grass" along the shores, and out in the open sea no plants were to be seen.

In 1777, O. F. Müller, the Danish zoologist, discovered that there were unicellular organisms in the sea that had to be regarded as plants. They could only be seen with the help of the microscope, and he described separate forms (species) of them. In the course of the next hundred years new discoveries were made in many countries, which showed the existence of a great variety of microscopic plant forms. One of the great contributions made by the Challenger Expedition was that it proved this everywhere and in all oceans. Gradually the idea developed with increasing clarity that these organisms, small as they were individually, might, on account of their enormous quantities, form the same basis for the animal life in the sea as the large plants on land for animal life there. Consequently, in the 'eighties the idea suggested itself of measuring the quantitative plant production of the sea with regard to volume, weight, chemical combination, and number of individuals of the various microscopic plant species per volume unit of sea water.

For this purpose implements were constructed for quantitative capture of the floating organisms, partly in the form of fine-meshed nets, used to sieve the water in a vertical column of the same diameter as the net, partly in the form of centrifuges, in which the organisms in a certain volume of water collected at the bottom. We are to a great extent indebted to the German scientists Hensen, Schütt, Lohmann and Brandt for the fundamental groundwork underlying the investigations in this field. Considerable progress was subsequently made by the above-mentioned Swedish researches, which probably first of all drew attention to the relation between the different water layers and their floating microscopic plants and the most minute animal forms, which had adapted their shape and mode of life in order to be able to utilize the unicellular plant forms.

These fundamental discoveries provided the first material for the great universal biological problem, which has since then been the object of marine exploration, namely, not only quantitatively to prove the occurrence of the organisms at a given time in the sea, but also to investigate the conditions of life of the different organisms, with their growth and propagation, and so to trace the origin of the production of living substances in the sea.

In a homogeneous water layer, where the suspended matter occurs everywhere in equal quantities and where the light and temperature conditions are uniform, we must imagine the floating, pelagic plants as evenly distributed points. They obtain their nourishment from matter suspended in the water. The flora of the sea, therefore, supplies the most favourable possibilities for a study of the dependence of life upon its surroundings, its environment and essential conditions. By making a comparison between the horizontal and vertical distribution of these plants, the quantitative occurrence of the nutrients, the intensity of the light and the temperature of the surrounding water layer, it has been possible to gain a clearer conception of the changes in the geographical distribution of the living creatures and their numerical strength in the different localities, than by any other investigation in nature.

It was evident, however, that this great programme of work could only be carried out by introducing a series of new methods and improvements of the quantitative determinations of the different chemical compounds and physical factors, especially the light, which control the growth of the plants. The importance and difficulties of these tasks may be realized when one considers that the substances indispensable for the existence of all living organisms occur in exceedingly small quantities. Thus the following amounts in milligrammes of the substances given below have been found per ton (1000 kg.) of sea water:

Nitrogen as nitrate or in other compounds, between 0 and 60.
Phosphorus as phosphate, between 0 and 60.
Silex as silicic hydrate, 10—1200.
Iron suspended in water, 20—200.

The methods for determining the amounts of these substances, of the light, and of the gases that are of paramount importance for the metabolism of all living organisms, i.e., oxygen and carbonic acid, necessarily became the object of critical investigations. These involved a standardization, carried out by specially appointed committees, of all subsequent research work, and this was not only set on foot and facilitated, but also, and above all, gave directly comparable results. In the course of this work new and valuable instruments were constructed, which to a great extent have facilitated the work even for non-specialists in this field.

The investigations made possible by these working methods are in the first place comparative studies, in the various areas, of the species present in each special case and of their specific environment. Through investigations of this kind it was learnt that the sea contains varieties greatly differing from each other, some characteristic of the open sea, some, on the other hand, of the coastal waters. Within these two large groups it is possible, again, to distinguish between polar (arctic and antarctic), boreal and tropical forms. The greater the knowledge gained the clearer became the comprehension of the specific connection that exists between the geographical area of distribution and both the shape of the species and the individual regularity of its occurrence at definite seasons in the waters where the conditions change during the course of the year. In his report on the occurrence of pelagic plants during the "Michael Sars" Expedition in 1910 H. H. Gran[1]) writes: "It has often been observed, not only by Cleve and Hensen, but also during previous researches made by the "Michael Sars" and during the "Challenger" and "Valdivia" expeditions, that the plankton changes its character the moment one passes the boundary between two currents".

While the tropic seas present the greatest abundance in the number of the *species*, their total number of *individuals* is markedly small in proportion to what can be found off the coasts of Europe. In the Skagerak tens of thousands and even hundreds of thousands of plant cells have been found per litre of sea water from the surface layer, and the individuals occurring there are even much larger and more valuable as food than the majority of the ocean forms.

However, the numerical ratio between the numbers of the individuals present at any given time in different localities is not in itself a criterion for estimating the production of the sea. This necessitates, in addition, a knowledge of the variations from one *time* to another in the growth, propagation and mortality of the individuals, primarily the mortality caused by the phytophagous small animals, most of which belong to the group of the Crustacea (the Copepoda). The study of this pelagic world of small organisms, which Hensen called *plankton* (the drifting organisms), is actually faced, therefore, by the same fundamental problems as those which in entirely different forms have engaged the attention of agricultural research. And in the comprehensive literature produced in recent years in collaboration with many scientists on both sides of the Atlantic, there is now to be found a wealth of observations showing how fruitful this comparison between the products of nature in the sea and on land is for both sciences.

Everywhere in nature it has been found that in places where plants and animals live in an environment which is not renewed, the infrequent, vitally important chemical compounds, chiefly of nitrogen and phosphorus, become completely exhausted, so that the environment becomes unable to support a "population" of plants and animals. A new growth cannot then arise until the water layers receive a fresh supply of these rare but indispensable substances. In agriculture this knowledge played a most prominent part during a century in the form of the law, formulated by Justus von Liebig, of the dominating factor existing "in minimum". It is a curious fact, which tempts us to regard life in the warm oceans as a brilliant adaptation, that the forms there are characterized by their small size or volume, where the food supply is scarce, and where their small size makes it easier for the organisms to keep themselves afloat in the warm water with its low specific weight. The organisms occur in the greatest numbers in those waters and at those seasons when fresh water from the rivers, or from currents intermixed with such water, supply new nutrient substances. In other waters, perhaps chiefly in the polar regions, a renewal of nutrients takes place by means of currents ascending from depths into which the dead organisms sinking from the surface have introduced large quantities of exactly those substances which new generations need for their growth.

In places where seasonal changes play an important part, as in the arctic and boreal (temperate) waters, a study of the floating organisms shows a very fluctuating ratio between plants and animals. Thus Lohmann found in the Bay of Kiel that in winter the animals outnumber the plants, which then constitute hardly a third of the plankton, whereas in summer the plants may form at least three quarters of the living organisms. The number of fissiparous plants must, according to Gran, decrease very quickly when the heavy reproduction ceases and great quantities are simultaneously wiped out by the animals. The animals must therefore on their part be able to store reserve food and to reduce their metabolism during the cold of the winter, until a new rise in temperature first accelerates the metabolism and then, at still greater increases in temperature, sets reproduction on foot, so that a new generation comes into existence coincidently with a considerable rise in the number of plants in the spring owing to the increase of light and temperature.

4. Animal Communities.

In all the thousands of catches made during the last generation by industrial fisheries and by scientific research the composition of the catches has been found to be remarkably regular. It is characteristic of each particular fishing-ground, but shows differences when comparison is made between the various grounds. These experiences have led

[1]) John Murray and Johan Hjort: "The Depths of the Ocean" p. 349, London 1912.

to the conviction that the regular occurrence of definite animal species under definite circumstances is due to the presence in every locality of conditions of life which satisfy certain common requirements of otherwise heterogeneous animal forms. Thus it is these special requirements that unite the different animal species to form what is called an "animal community", and the part of the sea satisfying the requirements of this community is known as the environment of the community.

Just as the object of plankton research was to describe not only the qualitative but also the quantitative occurrence of the floating plant and animal forms, especially in the upper water layers, the "region of light", where the products of the sea originate, so an attempt has been made to estimate the density of or "bonitate", all the different environments of the sea in comparison with each other. For this purpose special implements have been constructed for the quantitative capture of animal forms in deeper water strata as well as at the bottom of the sea and in water layers immediately above it. By the use of such gear, trawls, bottom scrapers, and bottom samplers of varying construction, it has been possible to gain pictures of the compositions of species, which may be compared with one another and which at all events give a preliminary survey or impression of the "populations" of the environment and of their "density". C. G. Joh. Petersen, the Danish biologist, has above all contributed to the raising of these problems and has made suggestions for the construction of special gear for quantitative capture (bottom samplers). A new and very valuable implement for such research is the echo-sounding apparatus which permits us to ascertain the pelagic occurrence at various depths of shoals of fishes, for instance herring and cod (Oscar Sund).

Through these investigations the important task arose of examining how each of the different species belonging to the same animal community was in a position to utilize the nutrient possibilities of the environment, and what these possibilities are in each case. Thus the sphere of marine exploration presented a wide range of problems greatly resembling agricultural investigation and the estimation of the different soils, with the plants they can support and the animal species in the soil that are found by the farmer when cultivating his land.

It was evident from the very first that this investigation must try to elicit the relation between the production of the sea in the "region of light" and the material consisting of dead forms in all stages of decomposition down to the fine dust called "detritus", which from the surface sinks down through the water masses, gives food to their inhabitants and finally, in the form of "mud", collects in the current-free parts of the sea, which Sir John Murray called "the mud-line" and which he assumed to be the parts where the sea bottom was richest in nourishment. But in this process of metamorphoses from living animals through all stages of decomposition to dust-like organic matter and from this further to the chemical elements that are the origin of all production in the vegetable world these indispensable substances pass through a long series of living organisms, which severally utilize them in the various stages according to the structure or function of the organism in question. Here, also, the echo-sounding apparatus has stood its test, since it permits us to gauge the depth of the mud sedimentation and consequently the quick and easy charting of the most important areas of this type (Rollefsen). Therefore it is also possible within the animal communities to demonstrate a multitude of heterogeneous adaptations for the utilization of the different forms of nourishment, which by the movements of the sea are carried from the areas of production, where the abundance is created, to the many heterogeneous environments, where this abundance is used anew to build up living substance. Nowhere can one so well study these constructive and destructive processes in all their changing phases as through coincident catches at all depths from the surface of the warm ocean to the eternal darkness of its greatest depth. Here better than elsewhere one can observe the great abundance of forms, changing from layer to layer in accordance with the changes in light, temperature, specific weight and wealth of food that occur from the surface to the bottom.

5. The Species and their Environment.

In order to be able properly to understand the origin of the various species it seems to be a logical necessity that we should assume that each species has arisen through a correlation between this species and a specific environment characteristic of it. The environment, which on first looking at the catches we conceive to be common to all the biologically associated species, must in reality comprise a great variety of different specific environments peculiar to each separate species in the said community. There must exist environments in nature corresponding to the botanical and zoological forms created by the evolution of the species. But this theory should not be interpreted as meaning that all the individuals belonging to the same species spend their entire lives in one and the same environment. If, therefore, we would discover the relation between the different species and their environments, we must study their history and investigate where and under what conditions the individuals live at all stages of their development.

With this object in view marine research has accomplished much valuable work ever since G. O. Sars 80 years ago found that the cod propagates itself by means of small, floating (pelagic), globular, hyaline eggs, about 1 mm. in diameter, which float on the surface of the sea. Fishermen have known for centuries that shoals of spawning

fish leave their respective habitats during the spawning season to congregate in dense shoals on the spawning grounds they have long known, where, according to the changes in the temperature of the sea, the shoals remain at various definite depths. When spawning takes place the little eggs float up to the surface, and there their presence can be proved by experimental catches, in which nets of silk gauze are often used to sieve the surface water. From 1900 to 1910 such investigations were made from all northern European countries in order to chart the spawning grounds of the various gadoids, cod, haddock, whiting, coalfish, ling and many other species, and this collaboration resulted in a systematic survey of the areas where all these species stay during the spawning season. The most interesting result from the scientific point of view was that each species had its own special spawning ground, so that the environment was specific for each species. The practical consequence of this investigation was the discovery of areas not previously exploited for fishing. The simultaneous catching of the small pelagic eggs and the spawning shoals of fish from deeper water strata gave the impulse to new practical activity of great economic value. In recent years the work devoted to these problems has received a new and very valuable contribution through the discovery that it was possible to chart the horizontal and vertical distribution of the spawning shoals with the help of the echo-sounding apparatus (Oscar Sund). By using this it will not only be possible to find the shoals themselves, but also to detect the external factors, salinity and temperature, under which they live at the critical time. Great possibilities have thus been opened for scientific and practical investigations with the aim both of establishing the laws governing the development of the animals, and of affording the fishermen the supervisory service they need for their work.

The fact that a great many species of fish, crustaceans and other animal groups propagate themselves by eggs floating at or near the surface has the great advantage for the existence of the species that the small larvae which develop from the eggs are able to find their nutriment there in the form of microscopic plants adapted to their requirements and size. As long as the larvae are small they follow passively the movements of the surface layer, but as they grow up they need food consisting of larger organisms: this demands more active locomotion and a change of environment to places where more favourable conditions of life are to be found. In the larger animal forms, therefore, whose life extends over a series of years, we everywhere meet with several characteristic stages, each with its definite average size and habitat. Very often one meets with "shoals" of young fish of almost uniform size, but belonging to different species, which live under similar conditions and hunt the same "food animals", often crustaceans of a certain size. In the case of the herring we can thus distinguish between small herring, different kinds of large herring, fat herring and spawning herring. All these "biological" groups live lives separate from each other, and each has its own proper environment. For this reason they are also the object of different methods of fishing, and the fishermen have from olden times given them different names, regarding and treating them as different kinds of fish, which is quite natural, as the fishermen use different gear for catching them, look for them in different fishing grounds, and sell them as different kinds of goods.

6. Races and Populations.

In the majority of species, perhaps in all, groups are formed which so to speak divide the distribution area of the species among themselves and which, irrespective of size-classes, live separate from each other. They are called races. The word "race", like the word "species", is a morphological term. The races are distinguished from each other by such varying characters as shape of the body, number of organs occurring in relatively large quantities, e.g., vertebrae or fin-rays, and finally as different growth-types. The investigations into these characteristics rest, consciously or unconsciously, on the assumption that, corresponding to the differences in the races, there are differences in the environments in which they live, and that it is through the influence of the environment that the race comes into existence. The German scientist Heincke raised these problems by his years of investigations into the natural history of the herring. He found that herring from different waters, Icelandic, Norwegian, North Sea, White Sea and Baltic, differed in several important body measurements, in the average number of vertebrae, fin-rays etc. Subsequent investigations have confirmed and augmented these observations, not only with regard to the herring but also as regards many other species. Johs. Schmidt, for instance, has shown that differences also exist in the cod in the waters already mentioned, and it is especially interesting that even in the narrow waters between the Baltic and the Skagerak, where temperature, salinity and many other factors vary from place to place, there are relatively small racial differences in the species of fish that are of chief importance to the fisheries there.

Out of this view of the geographical limitation of the races to definite areas there gradually arose the important conceptions connected with the words "population" and "stock", which denote a group of individuals distinct from all others both geographically and biologically. Thus we speak, for instance, of a herring population and a cod population off the west and north coasts of Norway that are different from the cod and herring populations of the North Sea and the Baltic. The experimental proofs

of the correctness of this view have been obtained by *marking experiments*. The method used in such experiments originates primarily from C. G. Joh. Petersen, who applied it in his studies of the migrations of plaice in the Danish waters. Subsequently the method has been applied in all northern European countries for the study of many species of fish. In the Norwegian Sea it was possible in 1913 to solve by this method the problems that had been engaging the attention of the fishermen for centuries, as it was then proved that the Lofoten cod migrated to Finnmark and returned in a following year to Lofoten as Finnmark fish. In experimental investigations of this kind the term "population" gradually came to be used as an expression for the conception of a collective group of animals, and this in its turn led on to using all the ideas and research methods that in the theory of human population had developed into the science called "population statistics".

7. Fishing Fluctuations.

At the great cod fisheries in the northernmost part of Norway off Finnmark the fishermen have been suffering for centuries from the extremely variable quantities of the catches. If a comparison is made between the millions of cod caught and the size of the available fisher population, the statistics from the close of the last century supply the following figures: In 1880 the catch at the Finnmark fisheries amounted to between 23 and 24 million cod, in 1883 to only between 3 and 4 million. In 1879 the number of fishermen was 17,000, in 1883 only 9000. These figures are not to be taken to mean that the number of fishermen determined the size of the catch. On the contrary, it must have been the natural conditions that determined the size both of the catches and of the population engaged in the fishing. It can easily be imagined how hard life must seem to those who have to reckon with a fluctuation of close on 400 % in the catches and who must be prepared for a change of 100 % in the number of the working population, and that only within the space of a few years.

A study of the age composition of the stock gave above all an explanation of these important natural phenomena. An analysis of the age of the cod showed that there were individuals exceeding 20 years of age, and that during the many fishing seasons that such a fish had survived the greatest changes had occurred in the numerical strength of the year-classes. Corresponding results were obtained from the investigations on the shoals of spawning herring, and it appeared that in these two important fish populations one single year-class, that of 1904, outnumbered the others included in the catches during a period of approximately 10 years, to such a degree that the profits the fishermen made from their fish were determined by the abundance of this year-class. From these first experiences from the beginning of the century it was natural to draw the following conclusion: The stock of a species may vary in size according to the size of the year-classes included in it at different times. At certain times there are more fish in the sea than at others, and these variations are wholly determined by nature, man having no influence on the course of events. It was clear that these experiences must lead on to the suggestion that a regular supervisory service for checking the stock of fish should be set up. This was all the more desirable as it had been found that a single rich year-class could dominate the fishing for a series of years and that by detecting a prolific year-class early one could predict its future influence on the fishing.

Following these earlier experiences, an international control was organized of the more important populations of food-animals, and of the qualitative variations of environments. Thus the International Council has undertaken social services analogous to the study of the economic market. In places where new populations of fishes, crustaceans or whales have been discovered, these discoveries have paved the way for new enterprises and have thereby added to industrial wealth. Whenever the catch exceeds the optimum limit, it will be the duty of scientists to draw attention to the threatened danger. The international organization has compared the results obtained year by year in the various regions of the sea, and has endeavoured to elucidate the general conclusions based upon them. In this connection scientific meetings of outstanding importance have been held, as in 1938 when the problem of growth-conditions was discussed, and in 1939 when the problem of overfishing was dealt with. The names of the eminent men of science of various nationalities who have engaged in these researches are in themselves an indication of the deep interest taken in these problems in all countries.

Everywhere the variations in age composition proved to be important factors that must always be taken into consideration when estimating the fishing results. The range of these variations does not, however, prove everywhere to have the same lasting influence, especially where the actual fishing greatly influences the size of the stock. In the waters where the fishing is carried out on banks, and where the trawl can be used, as on the great North Sea haddock fishery grounds, it has been observed that the variations in the size of the youngest year-class are as great as any found in the cod off northern Norway, but that the large and effective fishing fleet is able to reduce the richest year-class to such a degree that already in its third or fourth year it no longer exhibits the same numerical strength as before.

During the last 70 years other factors have also proved to be of very great consequence for our understanding of the variations in the large fisheries. In the 'seventies and 'eighties there was

very plentiful cod-fishing in the northernmost European waters along the coast of Spitsbergen. At the beginning of this century this fishing had entirely ceased and experimental fishing on the old grounds gave completely negative results. The catches consisted only of arctic animal forms, and from 1901—1902 the fauna and ice-blocks of the Arctic Ocean seemed to approach the coast of northern Norway, where for instance there was an immigration of common seals, bearded seals and white whales (Beluga), which were caught far south along the Norwegian coast. But these conditions changed again and a large new cod fishery developed far to the north along the coast of Spitsbergen, in which trawlers from many countries bordering on the North Sea took active part. Similar great fluctuations in the movements of the sea were proved to have occurred off the west coast of Greenland by Danish investigations, and in the sea round Iceland by Icelandic investigations. Thus there are great tasks for the international exploration of the sea in the combined study of the fluctuations of the sea and of the fauna within the whole of the vast sea area from Greenland in the west to Spitsbergen and the Barents Sea in the north and east. As a result we should not only be able to understand great natural phenomena at the time, but even to predict them in the future.

8. Fish Stock and Fisher Population.

By methods which made possible a study of the age composition of the stocks of fish, marine research has been enabled to make a new and intense study of the important problem that from olden times has occupied the attention of all seaboard populations, namely, whether fishing of increased intensity and technical efficiency can continue a *lasting* exploitation of the riches of the sea. It will readily be understood that a fisher population whose economic existence depends entirely on the yield of the catches must always be in fear that the stock will be unable to bear the toll taken of it by fishing. Naturally this fear increases especially where the fluctuations are great. Even if these fluctuations are entirely due to the forces of nature the seaboard population has always and everywhere attributed them to the doings and dealings of man. This is especially apparent when new and more effective fishing methods create a competition which the fishermen fear might reduce their possibilities of livelihood. For marine research, interested as it is in helping practical work, it is a problem of paramount importance to make clear which changes in the stock are caused by natural forces and which by human activity. This means examining to what degree the mortality of a stock is due to the fishing. It is evident that the biological statistics just referred to must be one of the most important methods in these investigations, and much work has been done to elucidate these difficult questions, especially in the countries where the fishing technique has reached a high degree of perfection, as in the countries bordering on the North Sea. Ever since the establishment of the International Council a large staff of observers have been measuring and analyzing hundreds of thousands of individuals of the most important species of fish, both from the catches of the professional fishermen and from those made by a large number of research vessels with the object of solving these problems. As a result, a remarkable and permanent characteristic decline could be observed in the length of life (average age) of the stocks during this period. It was possible to prove how many small fish are lost in trawling, as all fish entering the bag-net are suffocated and die. By means of marking experiments a numerical computation of the number of recaptured fish (the recapture percentage) has been made, and the equally important fundamental fact has been learned that during the long close time occasioned by the Great War there was a large increase in number, length, age and weight, in other words an increase of the older age-groups. The British fishery statistics for North Sea plaice and haddock show that in the period 1914—18 the average age increased and the mortality decreased because the main cause of death, namely fishing, was absent. Similarly the very thorough German studies of the plaice in the south-eastern region of the North Sea have shown that the two war periods, 1914—18 and 1939—42, displayed the same common traits. In both cases the result of the reduced fishing was that a larger number of plaice survived and attained a greater age. Apart from these common traits, however, there was one great difference which is responsible for divergencies in the picture as a whole. This difference consists above all in the arrival of abundant or impoverished year-classes which influence the rate of increase, in other words in the phenomena dependent upon nature herself (B ü c k m a n n). Future researches must take into account the fluctuations in the year-classes as well as the intensity of the fishing. As these experiences were substantiated by a steadily accumulating wealth of material, there also developed within ever-widening circles a clearer understanding of the view that the capture of any living creatures, whether fish, shrimps, prawns, seals or whales, should aim not at securing a *maximum*, but on the contrary an *optimum* catch.

This term denotes a catch which does not exceed the yearly recruitment of new individuals to the stock, *the reproduction of the stock*, nor is carried out by such large numbers of fishermen and with such a quantity of fishing gear that the *economic yield* can only be increased by an increase in catching capacity with a coincident decrease in average individual profit. This opinion had long been current in the sciences based on the exploitation of living organisms on land, in agriculture and forestry. But naturally a clear understanding of this

principle could only be attained much later in the fishing industry, since the experience there gained was not to the same extent accessible to direct observation, but had to be verified by conclusions based on "representative" statistics. As a result the great problem naturally arose as to what measures should be adopted in order to further the ideal of the optimum catch in our common international property, the sea.

Man has tried to solve this question in many ways in all spheres of his activity, on land as well as on sea. When he looked about for possibilities of improved conditions his first expedient from time immemorial was to seek new fields of activity by emigration.

9. New Fishing Grounds.

At the beginning of the 19th century fishing in all European countries was limited to the nearest coastal waters. Deep-sea fishing developed as an extension of this coast-fishing to the off-shore banks rendered possible by the invention of new gear, especially trawls and drift-nets, and by the use of sea-going vessels. To the Scandinavian countries the initiative taken by the Bohuslän fishermen was of the utmost importance. Their nearest fishing grounds were of course the Kattegat and the Skagerak, but from the middle of the last century they extended their bank-fishing with their small smacks and cutters along the "edges" or slopes of the banks down towards the depths of the Skagerak and the Norwegian channel right out to the slopes of the North Sea banks east of the Shetland Islands. Here the catch comprised ling, tusk, cod and halibut, the same as had for centuries been caught by the Norwegian fishermen's gear off the coast of Norway and on the slopes of the nearest coastal banks. For the Norwegian fishermen the news of the long-line fishing of the Bohuslän fishermen was of the utmost importance. When Norwegian naval officers had procured material by deep-soundings for nautical charts not only of the coastal waters but also of the off-shore coastal banks, the question arose of finding out, by means of special fishing experiments, possibilities of extending the sphere in which the coastal population worked. These experiments gradually opened new fields of activity, first for the native seaboard population and later for large fleets of trawlers from most of the northern European countries. These trawlers had already extended their field of action not only to the whole area of the North Sea banks, but also to the banks round Iceland and the Faroes, and along the Atlantic coasts of Europe and Africa; so that a great expansion may be said to have been taking place during the last hundred years in European fishing as a whole.

By examining the catches from these fishings marine exploration has gained important knowledge of universal value regarding the occurrence of the different species of fish in the extensive new fishing grounds. The study of this vast material shows that under similar depth, bottom and temperature conditions there is great agreement in the occurrence of the most important species of fish and in the composition of the catches. From a theoretical point of view it may be of special interest to mention that from Bohuslän in the south to Spitsbergen in the north hundreds of different small fishing grounds have been found where the Norwegian prawn *(Pandalus borealis)* is present in sufficient numbers to support a profitable trawl fishery, in places where the sea-bottom forms deep channels or small shallows covered with a fine dust-like silt and where fishing was formerly regarded as useless.

Experience from all these new grounds has everywhere confirmed the view that an expanding fishery in a newly-discovered area can at first count on heavy catches from a stock that is so to speak the accumulation of centuries, but that a more or less lengthy period of fishing causes a considerable reduction of the original abundance of fish. Thus the above-mentioned experiences from the statistical investigations of the "fish populations" of the old North Sea banks have been so strongly confirmed that the question of the most important means and methods for the best economic exploitation of the wealth of the sea has become increasingly urgent.

10. The Optimum Catch.

In order to secure remunerative fishing it is above all important to preserve the stock upon which the fishing is based. During the past years, therefore, several suggestions have been put forward for preventing the capture of fish belonging to the youngest age-groups, which in view of their small size were unsuitable for human food and which were of no particular market value, at all events in comparison with the value the same individual would have if allowed to grow and increase in weight. To this end the prohibition of fishing on the grounds where the younger age-groups live has been suggested. It has often been possible to put these suggestions into effect as national regulations, for the small fish haunt the shallow banks near the coasts, which are generally within the territorial waters of the country. But there are also cases in which valuable quantities of young fish can be caught in international waters. Thus large numbers of valuable halibut young are found in the prolific waters of the Faxa Bay on the west coast of Iceland, outside the territorial limit of that country. It is therefore a matter of immediate interest and urgency to come to an international agreement for the prohibition of trawling within the areas where this young fish occurs in abundance and where it is wantonly destroyed by trawling.

On most of the sea banks where trawling on a large scale is carried out from many countries it would be impossible, however, to prohibit trawling

without at the same time completely stopping this important industry. An attempt has therefore been made to attain the object in view as far as possible by two measures: first by provisions regulating the mesh size of the bag-net (cod-end), so that small unsaleable plaice, sole, haddock, cod, and several other species, can escape through the meshes alive, and next by introducing so-called minimum size limits for fish, prescribed by law, forbidding the landing and selling of fish below a certain size, in the hope that the fishermen would thus be led to avoid the grounds where the largest quantities of such small fish are found.

Both these measures can be effective only as international regulations, as the fishing in question takes place outside the territorial limits.

It has become increasingly clear that the question is one of the utmost economic consequence. To mention a single example only, it has been proved that on the Bear Island bank in the Barents Sea no less than 90 % of the trawl catches may consist of small unsaleable cod. And these considerations are of the utmost importance on all fishing grounds. Ever since international co-operation was established, however, the proposed regulations have had to contend with the conflicting interests of the fishermen of the different countries. The fishermen, especially when it is difficult for them to make both ends meet, have been greatly opposed to sacrificing anything in return for promises of the advantages they might obtain, for although the fish thus spared would subsequently become more valuable, they might then be caught by other fishermen. It has proved, and it is easy to understand, that fishing conditions have to become very unfavourable indeed before so many conflicting interests in the different countries can be united in the adoption of common measures.

It must therefore be considered one of the earliest and most important results of the work of the International Council that a convention was signed, by treaty of December 7th, 1929, between Danzig, Denmark, Germany, Poland, and Sweden regarding the regulation of the plaice and flounder fishery in the Baltic. A close season of two months (February and March) was imposed for the plaice and certain size limits introduced for the plaice and the flounder, and it was further prohibited to use seines within the 20 m. depth curve.

It was likewise very gratifying for those who for so many years had been fighting for these measures to see their hopes realized at last when they were asked to take part in an international conference, which on the initiative of the British Government and at its invitation was held in London in March 1937. Delegates attended from Belgium, Denmark, Finland, France, Germany, Great Britain, Iceland, Ireland, Latvia, the Netherlands, Norway, Poland, Portugal and Sweden. M. le Gouverneur Henry Baels, for many years Belgian Delegate to the International Council, has done the Council a great service by placing at its disposal a paper on the stock of sea fishes and the International Convention of London, to be found in the following pages. It mentions the excellent work of the various scientific collaborators of the countries bordering the North Sea and gives a list of the most important literature. The conference adopted a draft international convention to standardize the size of the meshes for trawl-nets, varying for the different marine areas, and also to fix a minimum size limit for the most important species of fish. Feeling that these provisions must be made adaptable to changing experiences and future events a proposal was adopted for the appointment of a permanent commission which should take the measures necessitated by further developments and progress in the work initiated in international waters. The conference expressed its gratitude to Mr. Henry G. Maurice, who had devoted many years' work to the furtherance of these measures. Owing to the difficulties that later prevented all international enterprise, it has, however, been impossible to organize a permanent institution of the kind, either for a scientific appraisement of the problems or for carrying into effect the practical measures on which general and unanimous agreement had been reached. Nevertheless it may be hoped that when better times come this cause will gain the support not only of international science but also of the various governments.

11. Transplantation of Young Fish.

It is understandable that the fishermen who were the victims of the great fluctuations in the stock, in the fisheries that was their only livelihood, should conceive the idea of increasing the stock in the same way that we can multiply the plants upon which agriculture is based by sowing and cultivation. This seemed all the more natural when they saw the large numbers of eggs that were evidently swept away from the home waters by the sea currents. An attempt was therefore made to keep back these eggs as long as possible in order to shorten the pelagic, floating stage of the life of the fish. This plan, however, met with such great difficulties that on closer investigation it was bound to be regarded with scepticism. It is undoubtedly correct that the high rate of mortality in the first stages is decisive for the numbers in a year-class. But it soon became evident that this could not be dealt with simply by isolating the newly fertilized eggs. The fact that the sea currents transport varying quantities of eggs year by year from one place to another is certainly not the only circumstance that determines how many milliards of individuals of a particular year-class there will be on the nursery grounds. It was realized at an early stage that the difference in the death-rate from year

to year must also be due to the changing environmental conditions during the growth of the younger stages, from the time when they have to look for their food in the surface layers where it is formed. It was here that the dominating factors must determine how large a percentage of the new organisms should survive the initial dangers. This old hypothesis, which had been tentatively advanced during the first investigations into the fluctuations of the year-classes, was definitely confirmed by recent studies on the development of the larvae both of cod and herring (Rollefsen, Soleim). Cultivation experiments were begun in various countries already several decades ago with the object of bringing large quantities of young fish past the pelagic stages, so that later, when transplanted into other waters, they would escape the fate of being carried away by currents. These experiments were successfully carried out on a laboratory scale, but proved of no practical use, primarily because the successful small experiments could not be applied on an industrial scale with millions or milliards of individuals. Further, the transplantation of the youngest bottom stages afforded no possibility of showing whether, from the point of view of production, there was a profitable correlation between transplantation and recapture.

Of late the first successful experiments have been made in breeding easily recognizable forms by crossing closely allied species, of which only a small number are found in the waters into which the youngest stages are liberated. Further, it has been possible by suitable feeding of the younger stages to satisfy their first food requirements and to obtain substantially increased quantities of the bottom stages (Rollefsen). At all events, then, it may be said that we have new hopes of witnessing an experimental activity that may solve the problem of artificially increasing the younger stages of a stock of fishes.

These problems must, however, still be seen in the future in the light of our earlier experience of the fate of the younger age-groups which became the victims of modern fishing technique. We have seen that even the most abundant year-class of haddock on the North Sea banks may very soon, perhaps even after its second or third year, be decimated to the same size as an originally much poorer year-class. Even a large-scale transplantation of small fish can, therefore, hardly improve the chances of life of a stock, if this is not at the same time protected by the measures mentioned above, primarily by minimum size restrictions for trawl-net meshes and for marketable fish.

In the course of his many years' studies, in Danish waters, of the life history of the plaice, C. G. Joh. Petersen made the discovery that in certain places, especially off the west coast of Jutland, there was an overpopulation of young plaice. He investigated the growth of the plaice and found that it was so slow in the overpopulated areas that the fish there were much older than those of the same size-group in other localities, for instance in the Belts, where there is more intensive fishing. These discoveries gave rise to the new idea of moving the slow-growing animals from the overpopulated places to those where growth was vigorous owing to overfishing. This was an attempt to improve the stock of fish by appropriate measures. Petersen was himself able to put these ideas into practice with great success and profit. Other Danish and Swedish scientists (H. Blegvad and K. A. Andersson) have supervised an annual transplantation of more than a million plaice from the west coast of Jutland to the smaller Danish waters and to the Kattegat, with profitable results for the fishermen.

These large undertakings must, nevertheless, be regarded merely as the first beginnings of a future activity which will certainly lead to important results both for science and for the fishing industry in all its ramifications.

THE STOCK OF SEA FISHES AND THE INTERNATIONAL CONVENTION LONDON, 1937

BY

HENRY BAELS

Dedicated to

Mr. Henry G. Maurice and Dr. Johan Hjort
Honorary President and President of
the International Council for the Exploration of the Sea
as a mark of admiration and friendship.

Henry Baels.

(Translation)

Preface.

THE INTERNATIONAL CONVENTION at which agreement was reached in London in 1937 will mark an important stage in the annals of sea fisheries. It set the crown on work done by men of science who braved all difficulties and dangers and plumbed the secrets of the sea.

These experts succeeded in defining the essential conditions of the life of fish and in revealing the threats to the depopulation of species and the impoverishment of the various fishing areas; they have enquired into causes and pointed out remedies. It is in the light of what they have recommended that Great Britain could set an example in the intervention of 1933 and that the other nations resolved to follow that example.

Deep gratitude is due to the International Council for the Exploration of the Sea. That Council was able to arouse, direct and organise investigation; it was able to discover and co-ordinate competent authorities. It succeeded in convincing Governments. It is to this International Council and to the outstanding qualities of its President, Mr. Henry G. Maurice, that we owe the agreement embodied in the Convention.

All should be glad of this, for any question of alimentation concerns public interests in all nations alike. But above all, ship-owners and fishermen must find in it matter for congratulation.

For this international understanding will fight against the destruction of reserve stock; it will aim at assuring abundance of fish; it safeguards the existence and the destiny of a maritime population; it substitutes the "*optimum*" for the "*maximum*" — quality for quantity.

From this point of view, it is hoped, the following pages will have their value as a beginning of a mutual understanding, of cordial co-operation and of solidarity, all to the advantage of humanity as a whole, and more particularly to that of that noblest among workers — the fisherman, the seaman who toils in the deep waters.

But the signing of the Convention does not mean that nothing remains to be done. Ratification by all the countries represented still is needed. The War has intervened and has interrupted proceedings actually in hand. So we have felt it necessary to hark back, in these pages, to the origin and the point of the Convention.

We have thought it desirable to interpret the articles on the basis of the minutes which represent the preliminary work. Thus we can best make sure of the mind of the signatories. We hope that this will be recognised as a modest contribution that may be of service to professional men, and to such administrative or legislative bodies as may be concerned.

I. The Protection of the Stock of Fishes.

For the last fifty years the depopulation of fish-stock formed the subject of discussion and research. We can affirm that certain alarming phenomena had not a little to do with the creation of the International Council for the Exploration of the Sea. Research undertaken by this Council, with the help of all the laboratories belonging to the participating States, provided information as to the biology, the migrations, and the movements of fish, but also made possible a scientific verification of the damage done, preparations for counteracting them, and a statement of such measures as were needed for doing so.

The International Convention of London, March 1937, issued from this undertaking; it was one first phase of the campaign decided on. If it is properly understood and scrupulously applied, it should be able to neutralise, in good time, the depopulation disaster.

These are strong words to use. They have brought a smile to the lips of professionals and even of men of science. Could the sea ever be depopulated? Has it not reserves that no force of man could ever succeed in exhausting?

No doubt the various species will never become extinct; but what we may fear is that in no distant future it will become impossible to exploit industrially certain food fishes by reason of their practical disappearance. The vanishing of their reserve-stock would indeed imperil not only the maintenance of a fishery making normal returns, but, as a consequence, our national food-supply. This does not therefore imply "depopulation" in its absolute and literal sense, but a substantial impoverishment.

Nor are all fish alike concerned. There would seem to be no danger for clupeoids and certain gadoids and pleuronectids. The serious danger threatens actually popular fish that for long have been abundant, like plaice, haddock, hake, cod, etc.

No one must be deceived by the impressive increase in the statistics of fishery returns everywhere. This is due to the development of fishing gear both in efficiency and in capacity. We shall have to reflect, soon enough, how to limit that.

It is, then, from these points of view that the matter must be considered.

A. Is Impoverishment a Fact?

Not many years had passed since the introduction of trawl-nets worked by steam by means of the *otter trawl*, when the inevitable decrease in amounts, sizes and indeed depopulation was being discussed among experts and by those who had interests in fishery. Coastal fishermen openly attacked the large shipping business because its fleets, impressive for their size and assisted by "carriers", were methodically scraping the bottoms of the Dogger Bank.

We will not here insist on the responsibilities of the trawl on the high seas; but it is important to locate the first protests which were made only a short time after the new and intensive use of such nets. It proves, at the same time, that they are by no means of recent date. However, these protests had but a slight echo, for the International Convention of 1882 imposed regulation of fishing on the contracting parties only in territorial waters. The upshot was, national legislation prohibiting fishing in such waters during the spawning season, and the sale of certain fish below a minimum size. Before the war, a notable diminution had already been clearly established as to quantity and size for plaice in the North Sea, haddock in the Moray Firth, and hake in the Atlantic.

The war of 1914—1918 was a peaceful time for fish, and permitted the injured stocks to reconstitute themselves. This respite is easily explained by mine-fields, the requisitioning of trawlers, the departure of most seamen for the front or for the navy, and by the danger of navigation in general.

Consequently, immediately upon the Armistice, fishing-fleets were considerably increased, and carried out a reckless fishery up to 1923; but then all accumulation of stock seemed to have been exhausted.

The utilisation of a greater number of fishing boats, the employment of better developed engines and more powerful gear like the V.-D. system disguised the true situation for a while. But no such illusion could conjure the facts. The stock was seriously going down. The North Sea was manifestly being depopulated.

Dr. le Danois, Director of the "Office Scientifique et Technique des Pêches Maritimes de France", sounded the first alarm in 1930. He treated the impoverishment of the fishing grounds as a recognised fact. Dr. le Danois, in the light of the theory of ocean transgressions, of which he had laid the foundations in 1921, had asked himself whether hake, plaice and haddock might not be subject to the variations due to the rhythm and periodicity of transgressions just as herring, mackerel, tunny and cod were. But this French expert unhesitatingly decided that they were not, and accepted as a fact the indisputable diminution of the stock itself, which was confirmed by Mr. Hickling, of the British fisheries department.

Reports from other scientists supporting the same view were numerous; we quote from among others Messrs. J. Hjort, O. Sund, d'Arcy W. Thompson, A. Bückmann, J. le Gall, J. J. Tesch, E. S. Russell, G. Belloc, Einar Lea, K. A. Andersson, Harold Thompson, Aage J. C. Jensen, H. Blegvad, H. Lissner, etc. We shall add a complete

list of the relevant publications of the International Council, Series Rapp. et Proc.-Verb., from 1929 to 1936, see Appendix IV.

But it is not only among men of science that we must seek for similar statements. The world of ship-owners and fishermen could not deny the brute fact, which none could overlook. Plaice and haddock of large sizes are now but seldom seen in the North Sea harbours; and the same holds good for hake in Channel or Atlantic ports.

The diminution of large-size specimens points to an impoverishment of stock. It points to a system of fishery which no more allows fish to grow big, and has as a matter of fact eliminated a whole category of large-size fish, important from the point of view of reproduction and of trade. The lessening of the size of fishes taken forms an important element in our assessment.

Quantitative reduction, too, would be of considerable importance, but, when making a comparison, we have to take into account of how far capacity of production is alike, and it is difficult to do this. The sum-total of international statistics does not, taken by itself, indicate quantitative reduction; that can be judged only when we consider, as well, the numbers of fishing boats and the perfection of the gear in use. If we could compare the actual results of a trawl with those of a few years ago, made by a boat identical in size and built of identical materials, the difference would be striking.

But even on the charts of sum-total statistics, plaice and haddock are very far from equalling the quantitative increase of other fish, granted the improvement in fishery methods. Statistics from the Netherlands enable us to illustrate our general observation by a significant example[1]). In 1915 the total returns of haddock rose to 32,633,947 kg., valued at 6,912,689 florins, while in 1928 the total weight sank to 10,355,270 kg., valued at 2,354,462 florins. The period 1910—1913 reports, as to haddock fisheries, 39 % of small-size haddock; the period from 1923 to 1930 carries this ratio up to 69 %. During the former period, the same fish of large and medium size stood at 32 %; during the latter, at 10 %. In England, the percentage of small-size haddock in the North Sea haddock fisheries moved from 42·5 % in 1913, to 81·7 % in 1928.

The phenomenon of impoverishment of stock in certain species is not confined to the North Sea and to a certain area of the Atlantic. It reaches to distant areas considered not many years ago as virgin areas, like the Icelandic ones. Mr. Sveinn Björnsson, Iceland's delegate at the London Conference, drew the attention of his colleagues to the appalling massacre of immature fish in "Faxa Bay" and stressed the necessity of a special protection within that zone. Mr. Arni Fridriksson developed this theme and invoked the statistics given by Dr. Tåning in his report to the North-Western Area Committee, 1934.[2]) Of plaice marked in Faxa Bay from 1925—1927, only 22 % were taken outside the territorial limits; as for those marked in 1932, the percentage rose to 53 %. This proves the increase of fishing-hauls. He further quoted Tåning who adds:

"This coincides with a very pronounced fall in catch per 100 hours trawling. During the years 1922 to 1933 we have the following cwt. per 100 hours fishing by English steam trawlers: 56, 50, 42, 48, 44, 42, 30, 30, 39, 30, 26, 20; the catch per 100 hours having thus decreased nearly to that of the North Sea fishery. The increasing intensity of the fishery is obviously too strong for the stock available."

As for haddock, Mr. Fridriksson continued, the average weight fished off Iceland per 100 hours trawling has decreased from 243 cwt. in 1922 to 85 cwt. in 1935. Dividing these years into two periods, we obtain a weight of 179 cwt. for 1922 to 1928 as against 111 cwt. for 1929 to 1935. This means a decrease of 38 %.

The International Council for the Exploration of the Sea held a meeting at Copenhagen in June 1932, and on that occasion the problem of the impoverishment of the seas was submitted to a thorough examination.

B. The Causes of the Exhaustion of Fishery Reserves.

The moment the impoverishment of fishing stocks is established as a fact, the very existence of certain fisheries imperilled, we must obviously reflect on how to remedy this. But research into the causes of the evil must necessarily precede the question of remedies.

Trawling worked by the intensive industrial methods would seem to have been first of all incriminated. But the main cause of the damage is not this. So long as fishing was carried out by means of the beam trawl, there were not so many complaints. People began to talk of "massacre" when nets were introduced which had been made wider by means of otter boards and heavier by means of ground ropes weighted by sinkers.

We cannot deny that such heavy gear towed along by our powerful steam and modern motors must work the bottom, scrape it, eviscerate it, tear it to pieces. Everyone will realise that this is useful for making fish which live deep down, or even in the sand or ooze, come out and make their way into the net. But we can also see how the loot includes eggs, larvae, immature fish, and all the organic and mineral substances that go to feed a fish. Trawling of this sort is one cause of the destruction of elements essential to the maintenance of reserves.

[1]) Ned. Vereeniging van de belanghebbenden by de Schar- en Scholvisschery.

[2]) Rapp. et Proc.-Verb., Vol. XCIV, part 2, p. 12.

Trawling for herring and mackerel cannot be indicted to the same extent, for in this case the nets are lighter and are rapidly towed along and do not rest upon the bottom of the sea, for they are meant to take surface fish.

When you reflect on the striking number of motorised vessels, all able to make use of the otter trawl — when you reflect on the fishing grounds remorselessly tormented and ravaged by hundreds of vessels you perceive in what sense high-sea fishery should be indicted.

But coastal and off-shore fishing seem to incur a still heavier responsibility. They are worked by means of the beam trawl upon a very fine bottom chosen as their shelter by the larvae of pleuronectids especially, for the sake of warmth and of the sun.

Coastal fishing is carried on at some distance from the shore, but is inclined to draw nearer to it, and aims at taking small fish for the table and for flour factories. It is carried on especially off Holland and is very deadly. It is known as "puf-visschery" and was relentlessly attacked by Dr. T e s c h, who dared to be unpopular by proposing and applying regulations.

Shrimp-fishing, whether carried on off-shore or further from the coasts is deadly because of the narrow mesh of the nets — only one centimetre square. Nothing can escape it. No doubt the very nature of the crustacean so greedily desired implies that the net's dimensions must be very small. None the less, its wholesale murder is much to be deplored.

Professor G. G i l s o n, Director of the Maritime Institute of Ostend, has enquired into the destruction of the young fish by shrimp fishery on the shores of Belgium. His report is dated December, 1935[3]).

During 16 consecutive months he caused the examination, identification, and measuring of 164,053 specimens produced by a motorised shrimper. The total destruction due to this single cutter was multiplied by the number of the other shrimping boats belonging to Ostend, and on this basis the total destruction amounted to 102,155,434 specimens. The species most frequently noted were sole, flounder, dab, plaice, whiting, red mullet, and skate, and accounted for 77,091,085 of the total.

The report adds: "If we calculate averages, basing ourselves on the numbers of shrimping-vessels working in the ports of Zeebrugge, Heyst, Blankenberghe and Nieuport, we are led to put the total destruction along the whole Belgian coast at 195,784,966 specimens of the seven chief species, that is, about 200 millions, not counting the 21,578 belonging to non-commercial species and the 15,234 specimens of commercial species which are found only in minute numbers in shrimping nets. Observe that this figure, 15,234, must be reduced to 1745 if one deducts the 13,489 young herring and sprat which are caught independently and outside the seasonal fishing for these two species."

No doubt the method used in this enquiry lies open to certain criticisms. Results based on the catch of a single ship regarded as the standard of measurement for an entire fleet, by multiplying them by the number of fishing boats, leaves too much room for probability. But the general impression will not have to be modified by tens of millions this way or that. We cannot escape the conclusion that shrimping, practised according to modern methods, is a massacre.

Dr. l e D a n o i s declared that all biologists agreed that for the sake of various little fish and crustaceans of hardly commercial size, shrimping destroyed pleuronectids, soles, turbots, brill and plaice by the thousand. The market value of these undeveloped products plays practically no part in fishing economics.

Insufficient nourishment and an inadequate supply of plankton can also be mentioned as a reason for the diminution of stock in the case of certain species. It has been ascertained that the east coast was unpropitious to the growth of small plaice and that the system of marking and transplanting fish ought to make it clear that the Dogger Bank possesses all that is needed for such growth. Districts exist, therefore, poor in plankton and in all sorts of nutritive products. But it has been pointed out that small fish can take their way towards more propitious areas and that the migrations are the explanation of this travel.

In connection with this topic, it has been claimed that a superabundance of small fish could not but diminish the available food-stuffs. Hence originated the theory of "thinning" — the practice of decreasing the number of fish in order to increase the ration desirable for each. If this be true, intensive fishery would be a blessing, not an evil. Any superabundance, it was argued, would soon be put right by the natural law of equilibrium which destruction would re-establish.

Undoubtedly there are certain regions where only "maintenance" food exists, not "growing" food such as is found in so many other places. But this would not bring about depopulation. It would explain only the existence of smaller and less fattened species.

C. Remedies.

These are of two sorts: those which are directly favourable to re-population, to growth, and to reproduction; and those which directly attack destruction.

The former category comprises methods such as transplantation, closed areas, prohibition of fishing, the exploitation of new grounds, and the rationing of production.

Transplantation is but a theoretic remedy. Specimens have been transported from one point to another by Danish and English biologists for

[3]) Ann. Inst. d'Etud. Marit. d'Ostende, Mém. 3. Lierre, 1936.

scientific purposes. The idea was to transport plaice from the densely populated coasts of the North Sea towards the Dogger Bank where plaice of a certain age were larger and heavier than those of the same age off the coast of the North Sea. The experiment did in fact provide a proof of better growth. Other experiments were made.

But these experiments, conceivable on a small scale or in closed waters could not be carried out on a large scale nor on an industrial basis. Even were they so possible, the expenses involved in such gigantic undertakings would be prohibitive.

The closure of certain areas naturally suggests itself as a remedy for impoverishment. But it would not appear to be easily practicable in open seas. Dr. le Danois (who calls such closed areas "international cantonments") raises the objection of the enormous number of ships that would be needed for supervision, and argues that from the biological point of view closed areas would be perfectly useless because fishermen would simply go elsewhere and destroy other species.

However, it would be possible to close certain seas of limited size, such as the Baltic, the Channel, and bays. The Iceland delegation had in point of fact proposed to the London Conference the closure of Faxa Bay, that marvellous nursery of fish which, none the less, is seriously threatened as is proved by the statistics mentioned above. According to the Icelanders, the other remedies under discussion were idle for their waters because of the slower growth, the late sexual maturity and the relatively high rate of mortality of young immature fish there.

Faxa Bay presents admirable conditions for the nutrition of vast populations of fish, according to research into fauna living on the sea-bottom, entered upon by the sub-committee created for that very purpose by the International Council. And an astonishing fact — all the fishermen concerned were in favour of an experimental closure of the bay during a certain period to be fixed by the International Council. It was decided to make special studies into the matter; a first meeting of the sub-committee took place at Reykjavik in August 1939, in pursuance of the decision taken at Berlin in the May of the same year.

Prohibition of fishing during certain periods could easily be carried out in territorial waters. It has in fact been decreed by certain nations and still subsists in others. It would be a way of partially eliminating the havoc for which some hold the shrimping fisheries responsible. When the Council met at Copenhagen in 1934, M. de Laurens-Castelet declared that coastal fishing was the cause of 90 % of destruction. It is true that this was disputed by the English delegates. But it remains certain that the conclusions reached by Dr. Tesch and Prof. Gilson have firmly established the devastation resulting from shrimping in districts sheltering legions of larvae and of young fish.

The exploitation of *new fishing grounds* would also allow grounds that have been worked too long to lie fallow. Distant areas are being more and more frequented — Iceland, Greenland, Bear Island, the Barents Sea, the Newfoundland banks, Mauritania etc. But these distances can be confronted only by large vessels. Trawlers of medium size and limited power will have to keep to the old bottoms.

We must remember that search for new fisheries, carried out on a wider scale by vessels able to make use of them, would markedly relieve the customary bottoms, precisely because these ships are more dangerous and more greedy. The older bottoms could reconstitute themselves precisely in proportion as more distant expeditions became general.

Rationing of production would also be of avail for checking intensive exploitation. Perhaps we shall some day find it desirable to assign a definite rate of production for each country and thus to limit the number of fishing vessels.

The experiment had been tried in England as early as 1937, first by an agreement between shipping companies, and then by the intervention of the State so as to immobilise a certain number of ships and so to reduce the size of fishing fleets. The result was considered very satisfactory; market prices had been discouraging, and now became remunerative, despite the cost of indemnifying the fishing companies and the fishermen thrown out of work.

This experiment was not concerned with the impoverishment of the seas but with commerce and gain. Still, at the same time it was of service to the preservation of maritime stocks. Thus a twofold end was reached. The experiment might well be repeated and would serve two purposes.

The second category of remedies is directly hostile to the destruction of young fish, and comprises the interdiction of certain gear, protective measures by means of controlling trawls, and the market-size of fish.

The interdiction of trawls and all instruments that actually scrape the bottom would no doubt be a radical measure. Drift-nets and lines have never been taken into consideration, and that, for quite good reasons. If the introduction of the trawl brought about a fishery revolution, its disappearance would provoke a far greater one. Anyhow, it is idle to dream of it, even as it would be absurd to call for the disappearance of all machines from industry.

Trawls have permitted abundant catches, relatively short expeditions, and regular supplies of fresh fish. The long-lines can no more be imagined save over certain bottoms and have henceforward only a much reduced importance. Drift-nets will retain their special objective — herring and mackerel, though for many years these fish too have been caught by trawls used by both steam and motor boats which seek only herring for

marketing fresh fish and bloaters. Herring to be sold salted or packed in barrels will remain the perquisite of the drift-nets. So much for fishing in the open sea.

The prohibition of beam trawls and weirs in the case of shrimping has been demanded. But shrimp fishers do not seem able to adapt themselves to the use of any other instruments; any substantial change would have to be studied and prepared for long beforehand.

A remedy that could be immediately applied and that would be of indisputable efficiency would be the introduction of *size-limits* for certain fish and a minimum size of mesh of the bag or cod-end of nets.

These were the two measurements retained by the International Council in 1934 when it met at Copenhagen and recommended to all Governments in view of a conference destined to issue into a general agreement. It is only right to say that these measurements had been examined into in 1932 and 1933 by the Combined North Sea and Eastern Channel Committee[4]).

But before the Copenhagen meeting in 1934, Great Britain had already initiated legislation based on the afore-mentioned measurements, thus facilitating discussion at Copenhagen and an understanding between all the interested countries.

This British legislation was the Sea-Fishing Industry Act of 1933. This law grants powers to assign limits to the size of sea fish and to regulate that of mesh and the construction of fishing gear. The law does not concern itself with specifying limits, sizes or so forth. It entrusts this to the care of competent persons who are to make the necessary decisions at the proper time. Thus the law is extremely supple. Limitation of size was imposed by order of July 29, 1933, as regards plaice, dab, sole, haddock, and hake. Nothing was in view save sale, possession, and exhibition for sale. Catches and landings were not treated of so as to avoid difficulties of supervision. These sizes were to be considered as minima so far as British fishing was concerned; some might be increased later on. As for whiting, witches, lemon-sole, and megrim, regulations as to size were imposed in 1934.

Restriction imposed on the size of mesh of the cod-end of trawls or seines must also be regarded as a minimum. It was fixed by an order of July 29, 1933; there were to be 21 rows or rounds to the yard when the net is unused and untreated with any preservative (22 and 24 in other cases). The net shall be stretched lengthwise for the purpose of measurement. This allows 12 stretched meshes per yard. This corresponds to a mesh of 3 inches measured from inside one knot to outside the opposite knot.

[4]) June 22, 1932 — Rapp. et Proc.-Verb. Vol. LXXXI, pp. 48/50. — May 10, 1933 — Rapp. et Proc.-Verb., Vol. LXXXV, pp. 34/35.

Local fisheries and territorial waters in various districts are regulated by byelaws. The law is applicable to all sea fishes save herring and shrimps.

This British legislation made a strong impression on the competent authorities in other lands, not so much because of the minimum size of the fish as by the regulations about mesh. Indeed, the size of the various fish was already legislated for in other States; but apart from arrangements concerning territorial waters and, e. g., salmon, sea trout, or eel fisheries, there was nowhere any restriction upon bottom gear comparable with that of Great Britain, save that of a 5·5 cm. mesh imposed in Iceland upon the Danish seine.

We may here present a review of the regulations existing in 1933 within the nations represented at the International Council[5]).

Comparative Review.

Plaice

27 cm.	in Norway and Iceland
26 cm.	in Denmark
(25·7 cm.	for the Skagerak, Kattegat, the Sound and the Belts)
24 cm.	in Germany (North Sea coast)
23 cm.	in Great Britain
24 cm. 21 cm. 18 cm.	} in various parts of the Baltic

Dab

25 cm.	in Denmark
23 cm.	in the United Kingdom
18 cm.	in Poland

Flounder

25 cm.	in Denmark
20 cm.	in Norway for the Skagerak
22—18 cm.	in the zones governed by the Baltic Convention

Sole

24·5 cm.	in Denmark
23 cm.	in the United Kingdom
15 cm.	in Belgium
13 cm.	in Spain

Turbot

32·5 cm.	in Denmark (21 for Bornholm and Christiansø)
25 cm.	in Belgium
18 cm.	in Poland

Brill

29·5 cm.	in Denmark
25 cm.	in Belgium

[5]) Rapp. et Proc.-Verb., Vol. XC, pp. 3/4.

Other Flat Fish

30 cm.	for witch in Sweden (Skagerak and Kattegat)
23 cm.	for witch, lemon sole and megrim in Great Britain

Haddock

24 cm.	in the United Kingdom
	in Denmark, the export to the United Kingdom of haddock of less than 36 cm. is forbidden

Cod

31 cm.	in Denmark (except for Bornholm and Christiansø)
25 cm.	in Norway (Skagerak)

Whiting

24 cm.	in Great Britain

Hake

33 cm.	in the United Kingdom
13 cm.	in Spain.

D. The Meeting of the International Council at Copenhagen, June 1934.

The Aim of the Council.

The aim was to provide objective recommendations to be made by the Council to the various Governments for the elimination of the destruction of fishing reserves due to the abuse of intensive fishery. Proofs of this disastrous destruction were now scientifically established. Despite the immense difficulties inseparable from marine investigation, biological knowledge of food fishes had made such progress as to enable the International Council for the Exploration of the Sea to put forward conscientious recommendations. This was the result of 32 years of work.

These recommendations dealt with the following two questions:—

(a) The necessity of saving small fish, especially such as approximate in size to dimensions of commercial value.

(b) The necessity of limiting the catch of small fish by a proportionate increase in the size of the mesh of nets.

The first point had been fully discussed during the 1932 meeting; the second had been frequently argued about, notably on that same occasion, and the principle had been admitted.

Deliberations.

The programme had been lucidly presented by Dr. E. S. Russell in a statement explaining the British legislation of 1933 and the conditions prevailing in other countries. After discussion notably on the necessity of examining into the damage done by shrimping, the following questions were formulated for examination by the committees[6]):—

1. (a) whether they can recommend the application of size-limits and mesh regulations not less restrictive than those enforced by Great Britain,
   (b) whether they can recommend measures either more or less restrictive, and
   (c) in the latter case precisely what size-limits for fish and regulations for mesh they recommend.
2. whether the use of the shrimp trawl is so destructive of small flat fish that its use ought to be prohibited as has been suggested, and
3. whether certain methods of fishing ought to be prevented in waters of less than certain depths.

The answers made it possible to put forward conclusions of which the integral text is appended, for the sake of the principles therein proclaimed, and also because of the weighty impression they made during the elaboration of the International Convention of 1937.

Conclusions.[7])

1) It is important, for the maintenance of the stock, that measures to prevent waste be taken by all countries fishing in the waters included in the Council's investigations.

2) The most useful measure of control will take the form of prevention, as far as possible, of the capture of young fish below the size at which they can be sold at a remunerative price for the food of man.

3) It has been shown that, in the case of the trawl net and Danish seine, appreciable protection of young round-fishes can be secured by regulating the size of mesh of the bag or cod-end. This method needs to be further elaborated, but enough experience has been gained to justify a minimum size of mesh which should be required in the construction of the bag or cod-end employed in the open sea.

4) The minimum mesh which the Council recommends is that already enforced by the regulations of the British Government, which, they are satisfied, will ensure the release of an appreciable quantity of undersized fish now captured and retained.

5) No way at present practicable of regulating the mesh has yet been devised which would secure the release of flat-fishes up to the sizes at which they ought to be protected and would not release marketable round-fish.

6) It is, therefore, desirable that size-limits should be imposed for flat-fishes in order to discourage fishing on grounds where small flat-fishes form the greater part of the population.

7) The imposition of size-limits is also desirable for round-fishes, in order to re-inforce the mesh-

[6]) ibid., p. XI.

[7]) ibid., pp. XII/XIII.

regulations, and to remove the temptation for fishermen to evade these regulations when at sea.

8) The foregoing proposals as to mesh are intended to apply in principle and so far as is practicable to all modes of fishing for demersal fishes both in the open sea and in coastal waters.

9) But they are not intended to apply to fishing for herring, sprat, pilchard and mackerel.

10) Certain fisheries, especially those for prawns and shrimps, involve the use of nets of small mesh. These fisheries lead, in certain areas and at certain times of the year, to the destruction of large numbers of fish in very early stages. Accordingly, where these nets are shown to be unduly destructive they should be regulated so as to reduce the destruction. The Council is not prepared at present to indicate what form such regulations should take; but suggests that the question should be carefully studied and regulations introduced by each country in the light of local conditions.

11) While the Council recommends the adoption by all countries, as a minimum, of the mesh-regulations in force in Great Britain, it takes note of the proposal of the North Eastern Area Committee that a larger mesh should be required for fishing in that region, such as is at present in use by German trawlers in Barents Sea and by the French at Newfoundland. The Council supports this recommendation in principle, and suggests that it be carefully considered by all countries fishing in those waters, and that effect be given to it as far as practicable.

12) The Council recommends the adoption by all countries, as soon as possible, of size-limits not less than those required by British regulations. It is of the opinion that experience will show that some of these might be usefully extended, and that size-limits might also be introduced with advantage for other fishes, especially cod. It wishes, however, to emphasize the fact that the chief thing to aim at is the prevention of the *capture* of undersized fish, and that accordingly the regulation of fishing should take first place.

13) The Council recognizes the difficulty of enforcing different measures of protection for different areas and different fisheries; but it considers that, when the question of increasing the minimum measures now proposed arises, this question will have to be faced and solved.

14) The Council is convinced that with a view to the ultimate solution of these questions, it is essential that each Government should arrange for further observations to be carried out by competent observers not only in research-vessels, but also in commercial fishing-vessels, and in the fish-markets.

15) The Council recognizes that the conditions of the Baltic Sea and the Belts present characteristics which differentiate the fishing of those waters somewhat sharply from the other waters coming within the purview of its investigations. Already international arrangements have been made for the regulation of the fisheries of this region and the Council does not wish as regards these fisheries to recommend more than that the principle of regulation by mesh and by size-limits for fish should be applied with due regard to the special conditions of the area.

E. Observations relating to the two Protective Measures approved and put forward in Great Britain, 1933.

1. Minimum Mesh.

The Delegates were in agreement as to the English regulation; but the measurement would have to be differently expressed. The 21 rows per yard corresponded approximately to 3 inches or 7·62 cm. The Convention proposed that a flat gauge 70 mm. broad and 2 mm. thick should pass easily through the mesh stretched diagonally lengthwise in the wet net.

This final formula was agreed to only after the discussion of several alternatives. Inspection could be carried through more easily by means of the gauge; on the other hand, in an international convention, it was preferable to use the metric system. For distant waters, the width of the gauge was to be 105 mm.

The English legislation, and the recommendations, mention only the cod-end, that is, the bag of the gear. It was proved that most fish escape through this cod-end. Since the mesh of other parts of the net are always wider than those of the bag, there was no need to trouble about them. According to its strict wording the text of the Convention mentions only the net, and the size prescribed applies to the whole of the net, but being a minimum size, it is of importance for the cod-end only.

The regulation concerning the mesh was absolutely necessary, and had to go hand in hand with that concerning the size of fish. The latter could interfere with sales, but not with destruction. The minimum size of the mesh prevents destruction and gives small fish a chance of reaching a marketable size.

The fixing of the minimum size for the mesh encountered strong objections. Commandant L. Beaugé[8]) considered it useless, because the net stretches when towed and prevents the fish from escaping, or mutilates or kills them. These objections were forcibly replied to by Capt. Thor Iversen[9]). The reports of F. M. Davis[10])

---

[8]) See "Note", Rapp. et Proc.-Verb., LXXXIX, part II, p. 14. Copenhague, 1934.

[9]) Some Remarks on Mesh Width. ibid., XC, p. 39. Copenhague, 1934.

[10]) Mesh Experiments with Trawls 1928—1933. Min. of Agric. and Fish., Fish. Invest., Ser. II, XIV, No. 1. London, 1934. (See also Rapp. et Proc.-Verb. XC, pp. 14—31.)

show clearly, after experiments with special gear that the width of the mesh has a remarkable effect on the escape of small fish, and further, that they escaped while the trawl was being towed, and not only when it was being hauled ("A Mesh Experiment indicating that Small Fish escape while the Trawl is being towed").

Experiments described in detail in Davis' reports ("A Commercial Mesh Experiment") further proved that of the two meshes used the wider allowed twice as many young halibut and hake to escape, and took a higher number of larger-sized fish. The trawler with a wider-meshed net brought back from every trip more than his companion, in spite of the loss of little fish.

In reply to the objection that small fish does not survive capture, we quote a rebuttal from a document of the Ministry of Agriculture and Fisheries[11]). It records experiments on board the "George Bligh" made off the Dutch coast (1935, 1936) where small plaice abound. Fish returned to the sea were afterwards re-taken in very high quantities. Most of those placed immediately in tubes of sea water were found alive after several days.

The effectiveness of the several sizes of mesh made the subject of very exact research. Already in 1906—08 Todd[12]) had found that the percentage of plaice, flounder, halibut, and whiting of various lengths could escape both from the beam trawl and from the otter trawl. It was demonstrated that the size of each species depended on the dimension of the mesh for escape or failure to escape, though the effect of the amounts taken and the rapidity of the tow could not be disregarded.

It seems certain that a mesh of 8 cm. releases large numbers of smaller halibut and hake. It is demonstrated that cod measuring 31·7, 31·2 and 28 cm. escape according as the mesh is of 8·7, 7·9, and 7·3 cm.; halibut of 31·3 cm. escapes through a mesh of 7·8 cm. Davis produced documents showing that a mesh of 6 or 8·8 cm. allows the following percentages of halibut and hake to escape:—

	75 %	50 %	25 %
halibut, length in cm.	21·5	23·7	26·0
hake, length in cm.	22·0	26·0	29·0

The widening of the mesh makes little effect upon plaice; so it would be useless to adopt some dimension that might save fish of 20—25 cm. in size, for example; for this would injure round fish and sole (the only flat-fish species that escapes easily). But we may usefully note that, unlike small plaice, small flounders are released in great quantities; that is excellent, in view of the great damage done to plaice by large quantities of flounders.

11) Min. of Agric. and Fish., Fish. Notice, No. 25.

12) Covered Net Experiments. Internat. Fish Invs., Mar. Biol. Assos., Rep. III (S. Area) (Cd. 5546). London, 1911.

2. Size of the Fish.

The aim of this regulation is two-fold: to support the regulation of mesh by diverting any temptation to shirk it by making use of a narrower mesh; and further, to take small fish off the market and to maintain and increase average prices. Abundance of such fish has poisonous results on sales and provokes headlong slumps.

This measure is complementary to that concerning mesh; but above all it exists for the protection of flat fishes. Flat fishes do not sufficiently profit by the width of the mesh (except the sole which in English is called "escaper"); and the veto on selling fish less than a certain length must encourage fishermen to throw small specimens overboard the moment they are caught. They survive, as has been proved, not least when the fish are caught by the Danish seine, which is undoubtedly a saving gear.

Regulation of the size of fish must also cause fishing in areas where small plaice abound to be given up. A whole category of boats deliberately let down their nets there, thus damaging the nurseries, destroying young fish, depriving stocks of their natural provisions and poisoning the fish markets.

Economic conditions and demand clearly vary from country to country. Thus plaice is limited to 27 cm. in Norway, to 26 cm. in Denmark, to 23 cm. in Great Britain, whereas limitation to this last length would be considered a serious sacrifice in Holland and Belgium.

No more need be said to justify the Conference in regarding its task as a most arduous one!

F. Remarks upon Shrimp Fisheries.

Attention had been directed, especially by the French delegation, to the destructive character of shrimp fisheries. One of its members reckoned that 90 % of the devastation must be attributed to this industry.

This assertion was controverted by Dr. Russell, who thought that the greater part of the destruction occurred on the high seas. He added that the loss of very young fish was not so disastrous for the species as their destruction later on. This opinion was backed by the researches of Dr. Bückmann. A closer study of the question was needed, and indeed the question was of enormous importance. If it was true that the coastal industry alone was responsible for the devastation, the proposed legislation would be useless. And it was essential, in view of the future, to be absolutely sure about the facts.

Belgium being very interested in shrimping, it was at the request of her delegate that the question was put upon the programme of the special biological meeting at Copenhagen in 1934. It provided the subject of paragraph 10 in the Conclusions (see foregoing page).

It was here shown that nets with narrow mesh, as used by this industry, brought about the destruction of a great number of bottom fish still in the first stages of their development. The Council insisted that regulative measures should be taken in each country, regard being had to local conditions.

A special study had been made in Belgium by Prof. Gilson, and we have already alluded to it. In his Mémoire: "Recherches sur la destruction du jeune poisson par la pêche crevettière sur les côtes de Belgique"[13]), M. Gilson presents conclusions drawn from a 16 months' study of the hauls made by a medium-sized motorised coasting vessel. He first establishes the enormous losses due to a fleet of 200 boats of equal power engaged in shrimping; he then concludes, as to mesh, that the nets in use must be modified because they do not allow more than a minimum of very young fish to escape, the saving effect of the usual trawl-net being very weak. "The raising of the size of the mesh up to a maximum which would still be reasonable for the shrimping industry would spare a very great number of extremely small fish of no commercial value but possessed of a 'recruiting' value (when taken together) proportionate to their size. This enlargement of the mesh would at the same time permit the escape of very little shrimps by way of a sifting which would take place while fishing was actually going on in the water. Trawl-nets thus adapted would produce a selective action in favour of the shrimping industry itself, for it would correct the anti-economic destruction of an enormous number of crustaceans too young to have any commercial value."

However, the writer considers that any definition of the greater size of mesh, such as would not injure the industry, must be the result of experiment, and that until we possess the results of such experiments we cannot consider the adoption of any rule for enlarging the mesh in use to-day; for a rule laid down now might bear too heavily on the shrimping industry which is so important on Belgian coasts.

This final conclusion was rather unexpected, and, were it admitted, would prevent our taking temperate measures in favour of fishery in general and of shrimping in particular. We do not doubt that the International Council must decide on the size of the mesh, both necessary and acceptable, and lay it before the interested Governments.

[13]) Ann. Inst. d'Etud. Marit. d'Ostende, Mém. No. 3. Lierre, 1936.

II. The London International Conference.

A. The First Assembly, November 1936.

An international conference was held in London, November 23—28, 1936, in order to discuss the recommendations made by the International Council for the Exploration of the Sea in 1934. These recommendations had to do with the supervision of fishing, by means of regulations concerning the size of mesh and the limitation of the size of fish.

The Conference was opportune. The impoverishment of the stock of fish had been scientifically demonstrated in the remarkable studies and reports due to the ceaseless labours of the International Council. Remedies had to be sought, and examined.

Great Britain had provided the example of authoritative intervention covering the whole ground. British legislation (1933) laid down a width of 7·5 cm. for mesh, and imposed minimum sizes for nine species of fish offered for sale.

In its meeting of 1934 at Copenhagen, the International Council had put forth, with absolute unanimity, certain recommendations asserting the necessity of an understanding between all the States that were interested and represented. These recommendations had been discussed by the competent organisations of each country. No doubt there was not yet complete agreement on all points and on all the numerical details, and fierce opposition had been encountered in certain circles, especially those concerned with the catch of smaller fish. But we can declare that in all countries the most representative and responsible constituents of maritime industry had expressed their formal and enthusiastic desire to see an international understanding come to pass.

The question had, therefore, reached its full maturity. The principle no longer lay open to dispute; all that remained concerned the methods of its application.

However, this task was far from easy. Prejudice, tradition, the interests of various groups whose complaints had been enregistered — all this had to be taken into account. Discussions were going to have to deal with centimetres, and this meant that they would perforce be long and possibly painful.

To give an idea of the chasm existing between various view-points, we may find it useful to exhibit the condition of legislation actually existing in the various lands concerned. (See opposite page.)

Countries represented.

Countries represented at the Conference by delegates or experts or both, were Belgium, Denmark, Finland, France, Germany, Great Britain, Holland, the Irish Free State, Norway, Poland, Portugal, and Sweden; Latvia and the USSR were represented by "observers".

Mesh Regulations for the Capture of Sea Fish in force November 1936 as far as known.

Regulations Local Applications and those included in the Baltic Convention (1929) omitted.
Regulations differing from those published in the Rapp. et Proc.-Verb. Vol. XC, 1934, and C, 1936, in brackets.

Belgium..... None.
Denmark..... None.
Finland..... None.
France*) ..... (2·5 cm. for all Drag Nets; 3·0 cm. for all Otter Trawls).
Germany..... The size of mesh at present in use in the deep-sea fishery (with the exception of Herring Trawling) is greater than the English legal minimum, being less than 13 meshes to the metre.
Holland..... (From 1-1-1937 no vessel for Trawl fishing can obtain a licence if the mesh is less than 7·5 cm.).
Iceland ..... 5·5 cm. for Danish Seines.
Irish Free State. None.
Latvia ..... General minimum, 2·5 cm. For capture of Flat Fish 3·8 cm.
Norway..... None.
Poland ..... Plaice, Dab and Flounder nets 4·5 cm. when net is wet.
Portugal ..... (Vessels of 70 tons gross fishing singly or 50 tons gross fishing in pairs propelled by engines or engines worked conjointly with sails. Mesh 4 cm. when wet. Sailing Trawlers 4·5 cm. when wet.).
Spain..... None.
Sweden..... (6·5 cm. between knots of extended mesh for trawls and seines fishing Baltic, Skagerak, Kattegat and North Sea).
United Kingdom 21 rows per yard unused and untreated to 24 rows per yard in any condition whatsoever (approximately 3 inch = 7·5 cm.) for the cod-end, bag or pocket of all trawl or seine nets.

Minimum Size Limits for Sea Fish in force November, 1936, so far as known.

Regulations Local Applications and those included in the Baltic Convention (1929) omitted.
Regulations differing from those published in the Rapp. et Proc.-Verb. Vol. XC. 1934 in brackets.

	Belgium	Denmark	Finland	France*)	Germany	Holland	Iceland	Irish Free State	Latvia	Norway	Poland	Portugal	Spain	Sweden	United Kingdom
	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.
Plaice	—	26		(14)	(24 for North Sea Plaice)		27		15	27	18	14 for Flat-Fish	—	27·0 in Skagerak, Kattegat and Sound	23
Dab	—	25		(14)	—		—		15	—	18	—	—	18-24 in Baltic	23
Flounder	—	25		—	—		—		—	20 for Skagerak coast	18	—	—	18-22 in Baltic	—
Sole	15	24·5		(14)	—		—		15	—	—	—	13	—	23
Lemon Sole..	—	—		(14)	—		—		15	—	—	—	—	—	(23)
Turbot.....	25	32·5		(23)	—		—		—	—	18	—	14	—	—
Brill	25	29·5	None	(23)	—	None	—	None	—	—	—	—	14	—	—
Witch	—	—		—	—		—		—	—	—	—	—	30 Skagerak and Kattegat	(23)
Megrims	—	—		—	—		—		—	—	—	—	13	—	(23)
Halibut	—	—		(55)	—		—		—	—	—	—	—	—	—
Haddock	—	36 for Export to United Kingdom		(17)	—		—		—	—	—	—	—	34 for Export to United Kingdom	(24)
Cod	—	31		—	—		—		—	25 for Skagerak Coast	—	—	—	—	—
Whiting.....	—	—		(14)	—		—		—	—	—	—	—	—	(24)
Hake	—	—		(17)	—		—		—	—	—	—	18	—	33

*) These regulations will be in force on 1st February, 1937.

Preliminary Meetings and Plenary Sessions.

The Conference was inaugurated by the speech of welcome spoken by Mr. W. S. Morrison, Minister of Agriculture and Fisheries.

The Minister immediately called the attention of the members to the danger of destruction which threatens the vital industry of fishing. Such destruction will be slow but sure unless a wise agreement for its protection can be reached. This is not a new question but it is one which is becoming more pressing on account of the rapid increase of fishing power, of the increase in the numerical strength of the fishing fleets and also of the increased destructive capacity of ingeniously constructed fishing engines. The North Sea, potentially the most productive fishing ground in the world, and the English Channel, once its competitor in fertility, are declining steadily in productivity. The effects of the intensity of fishing in the waters could be masked by the tendency to exploit more distant waters. But, even in those distant grounds, which so recently could be described as virgin fishing grounds, evidence of depletion is beginning to become apparent.

When the Council was founded in 1902, this question of over-fishing was already engaging the anxious attention of the participating countries. During the subsequent 34 years the chief preoccupation of the Council has been this difficult problem and in 1934 after a searching examination of all the data accumulated under its direction, it spoke with no uncertain voice in favour of measures of regulation, such as had already been introduced in this country.

The legislation and the orders put into force by the British Government could give a lead in the matter to the other countries. It is not the first time that Great Britain has sought by example to point the way to others. Surely in this matter no suspicion can possibly arise that one nation is seeking advantage over another, because we seek only to apply to all nations fishing the same waters identical regulations for the benefit of all of them.

The commercial experiments seem to prove that the enlargement of the net must pay, not only in the long run, but at once. Although that is so, British fishermen complain of the restrictions imposed, and say that they are deprived of the benefit of the capture and sale of small fish whereas the fisherment of other nations are under no such restrictions. Some Governments have followed the advice given by the International Council, but unless regulation on the right lines is fairly general, the complaints of the fishermen are justified.

If the British Government were not convinced that what is advocated would, if adopted, be beneficial to all our fishing industries, they would not have called the Conference. The magnificent tradition of the brotherhood existing among seamen should be able to stimulate the nations to get together and act for the common good.

Chairmanship.

Mr. Henry G. Maurice, Fisheries Secretary and President of the International Council, was invited to preside. He fulfilled his task in a most masterly way, and with a lucidity of judgment and a courtesy worthy of all praise.

The Discussions Programme.

No preliminary draft had been put forward. It had seemed better to obtain the adhesion of delegates to the essential elements in the measures to be taken. The drawing up of the clauses agreed upon could then take place more easily later on. The British legislation of 1933 was to form the basis for discussion.

The programme of questions to be debated was as follows:—

(1) The Regulation of the Mesh of Fishing Nets.
   (a) Trawl nets; and
   (b) Seines and other bottom-fishing gear.
(2) Regulations for prohibiting the sale of specified fishes below specified limits of size.
   (a) The landing of under-sized fish;
   (b) Their sale;
   (c) Both landing and sale.
(3) The practicability of saving under-sized flat fish after they have been caught.
(4) Other proposals, if any, for the protection of the stock of fish, either generally or locally.
(5) The study of the effect of protective measures. It is suggested that the International Council for the Exploration of the Sea might be requested to report from time to time on this subject.
(6) Methods for the speedy revision of the regulations in the light of experience.
(7) Heads of an International Convention.

Discussions.

These took place during numerous meetings of separate committees and in five plenary sessions. It would be tedious to enter into details. Remarks concerning the final resolutions will be found in the course of the analysis of the articles of the Convention. Enough to state the conclusions unanimously arrived at at the end of these first sessions, and to be presented to the Conference in view of drawing up a preliminary draft of an Agreement. It had proved impossible to achieve this result during the Session of November 1936. The standpoints of the delegates were too widely separated.

Had it been wished to put the text of a convention on to paper at all costs, the number of reservations and exceptions would have been so great as to neutralise all the effect of what had been agreed to. So it was decided to meet again at the beginning of 1937 in order to discuss the articles of a preliminary draft based upon such conclusion as all the Delegates had been able to arrive at. The text will be found in Appendix III.

B. The Second Assembly, March, 1937.

The Delegates had had time to get into communication with their respective Governments and to interrogate the official organisations and the economic units of their country. Each and all had evidently made a great effort to arrive at the agreement so devoutly to be desired. But no agreement existed — far from it — at any rate as to what concerned the size-limits for certain species.

This second assembly reunited the delegates of the same countries as had that of the year before, except the USSR. Iceland was a new-comer. Latvia now had its delegate. The assembly comprised seven plenary sessions, prepared by various committees.

A preliminary draft for an Agreement had been drawn up by a drafting committee and the offices of the Ministry of Agriculture and Fisheries. It was based upon the conclusions formulated during the first assembly.

Discussions were long-drawn and at times heated. In this or that case, divergence of views was manifestly very wide. It was quite evident that delegates had received an express mandate not to overstep certain limits. Beyond doubt, a certain reluctance to reach a compromise could not be explained otherwise than by the opinions of professional associations. The withdrawal of the French delegation came as a shock, though carried out with cordiality and courtesy, and justified because French legislation was so recent, in the direction aimed at, that it could not be expected to admit any modification thus early.

The otherwise justifiable abstention of the French delegation made possible unanimity of voting on the definitive text which resulted from these complicated discussions. The delegates, animated by an ardent desire for understanding, and convinced of the necessity of a ruling on the matter, found that they could persuade their Governments to make the indispensable concessions.

C. The Convention.

Interpretation of the Articles.

It may be useful to analyse the adopted Convention, article by article, basing ourselves on the details of discussions following on the official "Report of Proceedings". Notice that the English text of the preliminary draft served as base of the discussions. The French and German translations followed the adoption of the final text of the Convention. This will be found, in the three official languages, at the end of the present document; the English version is given here as Appendix I. The reader is referred to it for the understanding of the following proceedings.

Preamble.

This consists of the list of the signatory Governments. They are not more than ten. It may seem strange that the absence of certain countries of great importance in fishery has to be noted, and some explanation must be given. Spain did not send a delegate to the Conference, doubtless because of the civil war. Finland was represented, but its official had not been granted the necessary powers for signing. Portugal did no more than send an observer. France had sent an imposing delegation to represent her, and its members had taken a considerable part in the deliberations right up to the end of the meetings. But divergence of view became patent between the French and the rest. These differences of opinion did not, however, concern the principle of the need for an international legislation, but rather, the methods of application.

The French put forward the fact that regulations of the mesh and size-limits for fish had been arrived at lately among themselves, not without enormous difficulties and despite violent protests. These regulations, to be applied as from January 1, 1938, did not go as far as those aimed at by the Conference and already applied by Great Britain. And the French felt it impossible to modify a state of things so recently established.

The French delegates, therefore, finding it impossible to make larger concessions, preferred to retire so as not to interfere with the efforts of the other countries; and, by thus retiring, they made unanimity possible among those who remained. However, they fostered the hope of signing the Convention at no distant date.

These views were explained by Dr. l e D a n o i s, chief of the delegation, during the session of March 19. He made a formal statement which defined the position of the delegation in regard of the Convention, and its reasons for retiring. This statement is so important that we feel bound to offer its integral text to our readers, see Appendix II.

First Article.

This defines the sphere of territorial application.

It had at first been suggested to omit from the preliminary draft the phrase "in their territories to which the present Convention applies". But this suggestion, at the request of the Chairman, was set aside. Founding himself on the opinion of the Legal Advisers at the Foreign Office, he emphasised that it was necessary to indicate that the Contracting Parties were under obligation only to take domestic measures in respect of their own nationals. The question of ascertaining whether measures could be applied on the high seas would be left to the initiative of each country.

Article 12 foresees the possibility of extending the Convention to territories other than those foreseen in the previous article. Thus colonies and protectorates could be included. A special procedure was to be followed should they be admitted.

The Dutch delegate, Mr. J a n s s e n s, who had suggested the erasure of the clause mentioned above,

did not like the application of the Convention to dry land but only to the sea. This clearly could not be maintained. Rules concerning mesh must be respected as much on land as on sea. In practice, supervision would take place more easily on board the boats, in the harbours or on the quays themselves. Further, the landing and sale of fish of illegal size could hardly be carried out save on land. The phrase objected to was therefore justifiable on more grounds than one.

Article 2 and Annex V.

This article decides the sphere of application to ships. Several delegates had demanded the suppression of the word "fishing"; they wished to extend thus the rule to merchant ships which carried cargos of fish.

The British Board of Trade had opposed, on abstract grounds, the use of the single word "vessels" as comprising all sea-going craft. But in order to comprise ships other than individual fishing boats among those to which the rule was to be applied, Mr. M a u r i c e caused the definition of "fishing vessels" to be inserted in Annex V, thus rendering the objection void.

The term "vessels and boats" took the place of the single word "vessels" in the preliminary draft. This substitution was admitted on the request of the Belgian delegate, M. B a e l s, who quoted the distinction between "navires et bateaux" (vessels and boats) used in the code of Belgian maritime commerce, corresponding to a tonnage above or below 25 tons.

It was evident that vessels of all sizes must be kept in view. Strictly speaking, in the French text, "bâtiments" could suffice. It corresponds to the Dutch term "vaartuigen" and the German "Fahrzeugen", but it seemed preferable to leave no room in the text itself for doubt. Notice that English uses "vessels" to cover both "bâtiments" and "navires", and does not distinguish between the two words.

"Registered or owned" — "immatriculés ou armés" — "eingetragen oder beheimatet". Registration is not everywhere necessary for little vessels; but these too must be included. An understanding was reached after much hesitation about "registered or owned". The German and French translations are not literal; however, the meaning is clear and corresponds to the idea intended. True, one could have simply said: "registered or not"!

Article 3.

The discussions on this article bore on the following cases:—

1. The presence on a fishing boat of a fishing net with mesh of prohibited size.

Prosecution could not take place in the name of any State on its own territory save in the case of its own nationals. If it was a question of a foreign boat, the matter must be reported to the Government of its own country. Right of visit exists. If violation of law is discovered on the high seas, only naval ships of the country whose flag is carried by the boat have the right of visit, and they too alone have the right of prosecution. This Convention does not confer this right on foreign ships, unlike other international conventions where such a right is recognised.

2. Presence on board of fish of illegal size.

Prosecution is possible even in the case of foreigners; further, confiscation of fish is authorised. Landing and sale are, *a fortiori*, regarded as violations of domestic law. Evidently States have the right to regulate their legislation in regard of foreigners as they please. In Great Britain the above-mentioned rule is observed.

On the high seas, the presence of undersized fish can be observed with subsequent prosecution only by the naval ships of the nationality of the offender.

The better to make clear the points of view set forth by the delegates, it may be useful to quote the official minutes textually. (Authentic text.)

Consul F. C. S t a c k e l b e r g (Sweden) enquired whether Article 3 meant that a Government would prosecute its own nationals only.

The Chairman replied that in general it meant that each Government would undertake the enforcement of the provisions of the Convention in respect of its own nationals only. There would, however, be one eventuality in which a foreign national might be prosecuted, namely in the case of a vessel of another country landing undersized fish contrary to the laws of the country to which the port of landing belonged. The meaning of the Article was that each country would enforce its own laws within its own territory.

M. le Gouverneur H. B a e l s (Belgium) thought that the matter of the application of the penal laws raised by Consul S t a c k e l b e r g was a difficult one. He suggested that the example cited by the Chairman involved others; for instance, the question of a steam trawler calling at, for example, a British port for the purpose of landing there, if it had on board a trawl-net with meshes of an illegal size. This, as well as the matter of undersized fish, would be subject to the application of the penal laws of Great Britain. M. B a e l s further pointed out that on the open seas a prosecution could be instituted only by a naval vessel of the nationality of the offender. There were, in his opinion, two fields of application, the open sea and territorial waters. In territorial waters any vessel might be prosecuted by the home Government.

The Chairman thought that Mr. B a e l's suggestion was not in accordance with the intention of the Article. He considered that if a Belgian vessel came into a British port carrying a trawl not in conformity with the Convention, the British Government would report the vessel to the Belgian Government, so that it would be a question of the application of Belgian laws to a Belgian vessel. The British Government would undertake to pass legislation applicable to Great Britain. He thought that, if a foreign vessel landed undersized fish in a British port, that would constitute an offence against British law and therefore the vessel would be liable to prosecution in Great Britain, but that the carrying of a net of improper mesh would be left to the foreign Government of which the ship was a national. He would like to discuss the point further with the legal officers.

Mr. Janssens said he was favourably inclined to legislation of that kind. Oberregierungsrat Dr. A. Willer (Germany) enquired whether, in the case of a foreign vessel entering with undersized fish on board the waters of a nation, the fish would be impounded by that nation or whether the offence would merely be reported as in the case of illegal nets.

The Chairman thought that there were two alternative methods of procedure: to impound the fish or to report its presence. In Great Britain it would be regarded as an offence against domestic law and a prosecution could, therefore, be instituted. He would have the point made clear by the draughtsmen.

M. Laurens Castelet (France) enquired about the right of visit.

The Chairman replied that in his view and, he thought, in the general view, the right of visit existed in territorial waters. No provision was being made for right of visit on the high seas. It was a fact that there were conventions which empowered any fishery cruiser of the contracting parties to visit on the high seas and to make a report on what they found. This was not proposed in the Convention before the Conference, as it was thought that all necessary steps could be taken without right of visit. Each country could make its own arrangements to prevent its ships carrying nets with illegal mesh. The right of visit on the high seas was therefore unnecessary; it might be convenient in territorial waters where it was in any case exercisable.

Article 4 and Annex II.

This article defines the sphere of spatial application.

During the November session, efforts had been made to define the *North Atlantic* in a sufficiently precise way and to exclude American waters. The November conclusions echoed this preoccupation, excluding them as from south of 64° north latitude. The preliminary draft (Annex 1(a)) put down a different boundary, referring to waters west of 44° west longitude and south of 59° north latitude. These waters being excluded, the North Atlantic also had to be defined, which could be done by the use of the words: "the Atlantic Ocean north of 20° north latitude".

But no reasons had been given for the exclusion of this part of the ocean; and at the request of the Chairman the definition of waters to the west of the North Atlantic was considered unnecessary, and Annex 1(a) of the preliminary draft could be omitted.

On the other hand, a large number of delegates considered the definition of the North Atlantic to be useless; everyone understood what "North Atlantic" meant. But a request in view of a definition had been addressed to the Chairman who had consulted the Hydrographic Department of the Admiralty and received the following definition: "All those waters from the North Pole to the Equator lying between the Meridian of 60° E. Long. and the Meridian of 80° W. Long.". So no alternative was left save between the lack of any definition of the terms "North Atlantic and dependent seas", and that proposed by the Admiralty. The latter was awkward because it included part of the Indian Ocean. Mr. Hogarth offered a formula which obviated this: "The Atlantic Ocean north of the Equator and Arctic Seas between 80° W. Long. and 60° E. Long. and their dependent seas". This text was agreed upon save for one slight modification: "The Atlantic Ocean north of the Equator, so much of the Arctic Ocean as lies between.....".

The *Mediterranean* had been excluded at the request of the French delegation. Dr. le Danois had pleaded for this exclusion in November, 1936, emphasising the difference between Mediterranean and Atlantic problems and methods and the impossibility of applying to the former rules which perfectly well suited the latter.

Delimitations concerning the *Baltic* and the *Belts* had been animatedly discussed by the representatives of Germany, Sweden and Denmark. The November conclusions did not comprise the Baltic. The Danish delegate, Mr. Erichsen, said that his country not only would not oppose the application of the Convention to the Skagerak, the Kattegat and the Belts, but was anxious to extend it to the Baltic to the west of a line drawn from Utlängan in Sweden to the Polish-German frontier. This proposal was opposed by Dr. Willer (German delegation); in his opinion, the exclusion of the Baltic together with the Kattegat was imperative, since what concerned the size of fish was so different from what obtained in the North Sea and the Atlantic. This opinion was backed by Dr. Andersson (Sweden) except that he wished the Skagerak, the Kattegat and the Belts not to be thus excluded.

The demarcation of the part of the Baltic to be excluded was entrusted to a Committee composed of German, Danish, Finnish, Latvian, Polish, and Swedish delegates. The decision can be seen in (b) of Annex II of the Convention.

Paragraph 2 of Article 4 was no less hotly discussed. The question concerned waters in which one Government had exclusive rights of fishing. The nationals of this Government are exempted from the articles 5 and 6 in which size of mesh are discussed.

Exclusive rights of fishing can be reserved to the nationals of a certain country by international law; this holds true for territorial waters; the right of fishing there belongs only to nationals, and these can be affected only by the law of their own country. It is however desirable that the rules regarding mesh should be introduced into each state even for their territorial waters.

Exclusive rights are reserved by virtue of international conventions. These are the North Sea Convention (1882), the Anglo-Danish Convention concerning Iceland and the Faroës (1901) and the Convention between Great Britain and France concerning the Channel (1843).

The preliminary draft, on the basis of the 6th conclusion, offered a text which corresponded to the recommendation but which specified at some length

the two contingencies. Here is paragraph 2 of article 4 of the preliminary draft:—

"Articles 5 and 6 shall not, however, apply to "any waters in which the nationals of any High "Contracting Party enjoy the exclusive rights of "fishing under international law. Where the waters "come within the area covered by any of the "following conventions, namely (here specify the "conventions) the provisions of these conventions "shall be applied to determine the exclusive rights "of fishing so far as nationals of parties to these "conventions are concerned."

The distinction between international law and conventions was considered useless, and the first phrase alone was retained, the words "under international law" being suppressed. The word "nationals" was suppressed. Rights are not granted to individuals but to Governments. This explains the use of the term "Contracting Government" instead of "High Contracting Party".

This exception, which had encountered strong opposition from Norway, whose delegate had expressed fears for the future without, however, defining them, was not destined to be so much as formulated. Special laws derogate general laws. But the moment reservations had been mentioned, it was better to make the intentions of the contracting parties quite clear, lest special conventions should be considered to have been suppressed.

This preoccupation of the Conference proves what prudent care it took not to antagonise certain interested countries and thus to endanger the adoption of the Convention. And indeed, why could not the regulation of mesh be applied in territorial waters and where any one country had exclusive rights of fishing? The moment it was found necessary and useful for eliminating the destruction of fish stocks, it ought to be put into practice everywhere. This would in no way invalidate the exclusivity of rights of fishing.

Article 5 and Annex III.

This article contains the regulations for the size of mesh. It states further the vessels and kinds of fishing to which they apply and the fisheries to which they do not.

The dimensions of the mesh are given in Annex III. They differ according as waters are situated north of 66° N. Lat. and east of the meridian of Greenwich on the one hand, and all other waters on the other.

The text of the preliminary draft did not contain the word "boat" following "fishing vessels". It was however added, in conformity with the previous decision to distinguish between boats and vessels.

The text of the preliminary draft said "net towed at or near the bottom of the sea", and not "hauled". The word "hauled" was added at the request of Capt. Iversen (Norway), as being preferable to "dragged".

The dimensions had been recommended in November, 1936, and were identical with the prescription of the British legislation of 1933. There was no more discussion on this subject.

But Dr. le Danois intervened in the name of the French delegation to plead for the exception of the small-fish fishery as practised in territorial waters and — though more seldom — on the high seas but always in view of the coast, using a trawl with a 12-metre beam or a 12-metre headline; the mesh of these nets measure 2·5 cm. according to the laws in force.

M. H. Baels, the Belgian delegate, disputed this proposal and declared it to be illogical, seeing that the purpose of the Conference was, precisely, the protection of small fish. Though Dr. Willer (Germany) was inclined to adopt the proposal, in order to preserve the adhesion of France to the Convention, the Chairman, Mr. Maurice, attacked it in his turn. It would mean, said he, not only limiting the Convention to certain waters, but also, limiting it to vessels of a certain size. It would mean permitting the exploitation of small fish by means of as many embarcations as possible using smaller trawl-nets. If the Conference really intended to protect small fish by improving size-limits, there would be no sense in using a mesh which would take the very fish they wanted to protect. In reality, the regulations regarding the size-limits of fish ought logically to precede those of mesh, so as to discourage the fisherman from seeking to take fish which he could not sell.

Dr. le Danois intervened again and was supported by M. Sarraz-Bournet, and a section of the delegates (including Dr. Johan Hjort, Norway) seemed willing to accept the French reservation, all the more easily because France accepted the size-limits also for fish caught by means of smaller-meshed nets. The suggestion was postponed and then abandoned when the French delegation felt obliged to retire for the reasons given in the declaration (see App. II).

The second paragraph of Article 5 proposes to admit smaller-meshed nets for specific kinds of fishing, with the reservation that the Governments undertook to make regulations to prevent abuses.

The preliminary draft submitted the use of smaller mesh for the special fisheries mentioned in par. 2 of Article 5, to license to be granted by the authorities of each country in view of avoiding the use of such nets for other species.

The Chairman, Mr. Maurice, considered that the system of licenses contemplated by the British delegation consisted in a document stating the conditions of authorisation; this document would be kept on board and render control possible. If a certain percentage of other species was landed, it would be confiscated and the license cancelled. But other delegates, especially the Germans, thought that this system of licenses was too alien to their habits and difficult to put into practice. Great Britain was accustomed to such licenses. The Chairman gave

due consideration to these remarks, and suggested an alternative wording, suppressing the term "license" and leaving to each Government the liberty of acting as it thought best, provided of course that the measures contemplated were effective. The text of the Convention complies with these demands.

The special fisheries which should justify the use of smaller mesh were confined by the preliminary draft to those of herring, sprat, eels, shrimps, prawns (not including *Nephrops*) and to molluscs. The final scheme increased the list of exceptions, and included mackerel, clupeoid fishes (herring, sprat, pilchards, anchovies), eels, large weevers, shrimps, prawns, *Nephrops*, and molluscs. Denmark had insisted on the insertion of mackerels and *Nephrops;* France, of the pilchard; and Sweden, of the weever.

Article 6.

This was but a corollary of the preceding article and gave rise to no discussion.

Article 7 and Annex IV.

The veto contemplated by this Article was the most important of the Convention, because even were there no ruling as to the size of mesh, it would discourage the catching of immature fish. Indeed, of what value would such a haul be, since their sale and even detention on board were impossible?

The 1933 British legislation had not foreseen more than the veto upon sale. It had been explained at the November meeting that the British authorities felt that all supervision of landing and of presence on board was impossible. Many delegates had remarked that sale and landing were forbidden in their country, in Germany the transport also. The November conclusions show signs of this discussion (No. 3).

The preliminary draft contained Article 7 as follows:—

"It is forbidden in the territories to which the "present Convention applies to land from any "fishing vessel, sell, or expose or offer for sale, "any sea fish of the descriptions set forth in Annex 3 "of less sizes than the sizes prescribed therein for "each fish."

The final text of the Convention displays the following modifications:—

— the suppression of the words "from any fishing vessels". The words "or boats" would have had to be added to correspond with the terminology of the other articles and the prescriptions of the Board of Trade.

— the removal of the word "fishing" at the request of Mr. Sveinn Björnsson. Naturally the landing of prohibited fish from a non-fishing vessel could not escape. Thereupon the words "from any vessel" became useless. The word "landed" applied to every ship.

— A paragraph was added to the text of the Convention: the second paragraph, which did not exist in the preliminary draft now contains the words: "The Contracting Governments will "make and enforce regulations so that the pro- "visions of this article shall not be evaded in "any case where the fish in question have had "their heads or any other part removed."

How is this addition to be explained? Annex IV of the preliminary draft contains a third column entitled: "Size Limit for fish beheaded or otherwise artificially reduced in length". The minimum sizes for decapitated fish were there reduced by 3 to 5 cm. according to the various species, corresponding to the sizes in the second column regarding unmutilated fish measured from the tip of the snout to the extreme end of the tail fin.

The Chairman, Mr. Maurice, proposed the suppression of the third column so as to escape the practical difficulties raised by Mr. Janssens (Holland) and Dr. Willer (Germany). But, on the latter's request, it was ruled necessary that the several Governments should take measures that by beheading or otherwise shortening fish the rule about forbidden sizes should not be evaded. That is why paragraph 2 was added.

Other modifications were rejected. The first was the proposal of Dr. Andersson (Sweden) who wished to authorise coastal fishermen to carry off home small fish for domestic consumption; he proposed to forbid only landing for sale.

The Chairman could not agree with this, first, because the proposed formula permitted the evasion of, e.g., fish landed to be transformed into fish-flour, and further because the protocol could explain that the delegates were agreed on excluding the application of Articles 7 and 8 to cases of this sort, which were, moreover, of very slight importance. Thus, no special clauses would be needed in the Convention.

Another amendment was presented by Dr. Andersson in the hope of specifying more accurately what fish were forbidden to be landed; he suggested the words "fish caught in the waters to which the Convention applies". Delegates Dr. Tesch (Holland) and Mr. Erichsen (Denmark) and the Chairman opposed this amendment because it would authorise the landing of fish taken in waters not foreseen by the Convention, those, for example, where there were exclusive rights of fishing. This must be prevented.

Annex IV. Minimum Sizes of Fish.

We find here certain differences from the text of the preliminary draft. First, the suppression of the third column which has been fully explained. Further, the elimination of three species — whiting, dab, and halibut. The list of 13 species is thus reduced to 10.

Dimensions have been modified for 2 species: the 25 cm. of plaice have been changed to 23 cm.,

and the 23 cm. of the sole to 21 cm.; hake and cod were reserved in the preliminary draft, and their sizes have been fixed at relatively 24 and 30 cm.

The changes to and fro during the discussions between November and the authoritative text were evidently varied and complicated. Enough to cast a glance to the November conclusions to realise how standpoints were changed: look at the catalogue of agreements, disagreements, reservations! The terrain was disputed, you may say, inch by inch.

A layman might consider the dispute mere quibbling. Experts, however, know how important one centimetre more or less can be. Hence violent protests will be made in the course of parliamentary discussions, or when proposals based on the Convention are to be put into practice. Delegates were brave and sensible enough to disregard recriminations and objections of all sorts, and to remain upon the lofty plane of science and regard for the future.

But even this attitude of the delegates took time to consolidate itself. They unconsciously felt themselves enchained by the particular interests and prejudices of their respective countries, and accepted nothing which could exceed what was nationally permitted. Confronted by these conflicting views, between which it seemed at times that harmony never could be made, the Conference, if it did not wish to come to nothing, had to have recourse to one or the other of the following methods. Either reach an agreement on very low minima and for all fish without exception, or, catalogue such agreements as had been come to for certain species and postpone the application of the certain others (since the figures were judged to be too high at the present moment) till a later date to be fixed forthwith in the Convention. One could conceive of a third option fixing the sizes which were agreed to by all, and furthermore providing for proceedings which would permit sizes to be introduced later which were not at the present moment acceptable.

A Committee was created for the purpose of discovering a formula that all could accept, basing itself on the minima of 24 cm. for cod, haddock, whiting and hake; of 20 cm. for plaice, dab, witches, lemon sole, sole, and megrim; of 25 cm. for turbot and brill. The report of the Committee, presided over by Dr. H j o r t, noted agreement on four species — cod, halibut, turbot, brill. A length of 23 cm. for plaice, witches, lemon sole and megrim was agreed to except by France (18 cm.) and by Holland, which could agree to 23 cm. only after a year's elapse. The length of 23 cm. for sole was refused by France (18 cm.), Belgium (20 cm.) and Holland (19 cm., and 21 cm. after a year's elapse).

The Committee therefore proposed a convention so far as the four species admitted by all were concerned, and the institution of an organisation to be created by the Permanent Committee in consideration of Article 11, purposing to facilitate and organise an understanding between States as to other species. Hardly were the conclusions of this Committee read, than Dr. T e s c h and Dr. l e D a n o i s proclaimed them inadmissible as a convention which did not include agreement about plaice was inconceivable. Now the Committee had rejected the minimum of 18 cm. for plaice as insufficient.

This incident brought about the abstention of France from the entire Convention. The declaration has been mentioned above. It was intended to remove an obstacle to a final agreement, for France opposed an absolute veto for the reasons there given. Not but what its ultimate adhesion is very probable.

The mere account of this incident shows what earnest endeavours to understand one another and to take due initiatives had to be demanded of the participants, if the dimensions so fiercely disputed at the outset were ultimately to be accepted.

Article 8.

This involves a veto upon retaining on board fish dimensions less than those of Annex IV, but it contemplates an exception — the carrying of live fish from one fishing area to another. Its scientific and economic character is clear.

Article 9.

This deals with regulations for exceptional gear such as is tolerated by paragraph 2 of Article 5, and the obligation of returning to the sea fish of prohibited sizes so far as is reasonably practicable. It is patent that these regulations must be established and applied by the Contracting Governments.

At this point a question that occurs spontaneously to the mind must be answered. Does it follow that vessels and ships using nets with smaller and finer mesh may keep fish of legal size on board? It was Mr. E r i c h s e n who asked this question. The Chairman answered that Article 9 must be interpreted in the light of the end of Article 5: measures to be taken in each country were there dealt with, which should prevent nets which benefited by that exception (because destined for special fisheries) being used for fishing other species of fish. No doubt the regulation must be applied in a tolerant way. It was a certain proportion that must be fixed. If a ship equipped for herring fishing were to return with 50 % of halibut of the prescribed size, it would be very doubtful if its nets would have served for herring. There must therefore be a decision of what proportion would indicate accidental catches as opposed to fraudulent ones and an intention to evade the law. The two Articles 5 and 9 make the Convention's meaning perfectly clear. It belongs to the Contracting Governments to establish rules which should obviate such eventualities.

Mr. E r i c h s e n further asked if a vessel equipped for taking cod, halibut, plaice etc. might also have on board nets for fishing herring, shrimps

etc. The Chairman answered that it would not be allowed in England. This case would have to be settled by a national legislation; and it was clear that the reply must be in the negative.

Article 10.

Purely scientific research cannot be subject to the Convention, whether for the process of fishing or for the fish caught during fishing operations. Scientifically, mesh or fish may be of any size. All the same, undersized fish cannot be sold and are subject to the veto of Article 7 and Annex IV.

But what is to be the fate of fish sold by fishermen to scientific institutions or special departments or governments? It was decided that the protocol should contain a clause saying that vetos on sale did not apply to official organisations or institutions concerned with transplantation of fish. The right to profit by exceptions must not be extended to individuals.

Article 11.

This text issued from a proposal put forward by the German delegation, the phrasing being that of the Foreign Office. The preliminary draft thought it enough to establish the obligation of the Governments to designate representatives for a Permanent Committee whose business it should be to revise the proposals of the Convention, in union with the International Council for the Exploration of the Sea, and to recommend what should assist amelioration and extension. No definite form of procedure was contemplated.

Dr. Hjort proposed an addition to Article 11, viz.: "For the purpose of embodying such recommendations as have been mentioned above, the Permanent Commission should move through the intermediation of the British Government with regard to the proposals communicated to the other Governments."

The German delegation, on its side, proposed a series of clauses destined to render possible the drafting of a totally new article as follows:—

— The Conference decides to set up a Standing Committee.
— The States which have ratified this Convention are entitled to send one representative to this Standing Committee.
— The Committee examines, on the basis of advice given by or sought from the International Council for the Exploration of the Sea, the necessity of extension or alteration of the provisions of the Convention.
— Unanimous decisions of the Committee will be transmitted by the British Government to the High Contracting Parties.
— The Governments undertake to put into operation the unanimous decisions of the Standing Committee within a period of one year after they have been communicated to them by the British Government.
— Each Government undertakes to inform the British Government of the decisions taken and the British Government on its part undertakes to inform the other High Contracting Parties thereof.

There was not really much difference between the two proposals. The German proposal supported by Dr. Weber urged the automatic execution of recommendations unanimously put forth by members of the Standing Committee. Certain delegates did not like the idea of a plenipotentiary delegate; but the Chairman, Mr. Maurice, succeeded in reassuring them by underlining the fact that every Government would instruct its representative as to how far concessions might go after a deep study of the question in hand. No one need fear that a delegate would outstrip his instructions or decide anything contrary to them. If a delegate failed to give his opinion or abstained from doing so, there would be no unanimity. The German proposal was drafted into the text of the Convention by the Foreign Office, and this is what the new Article 11 consists of.

Article 12.

This concerns Colonies, Protectorates etc. Each Contracting State can seek for application in its colonies etc., having made the aforesaid declaration. Withdrawal from the application is effected by means of the same procedure.

Article 13.

This deals with the procedure regarding the deposit of the ratification of the Convention. Each country shall ratify the Convention and transmit all instruments of ratification to the British Government.

Article 14.

The present Convention comes into force three months after all the signatory Governments have handed in their instruments of ratification. This condition, consequently, involves any one single Government being able to hold up the effect of the whole Convention. The Chairman read the Foreign Office text which should obviate this difficulty. This amendment stipulates that the Convention shall come into force for all the Governments which have ratified at three months after the deposit of instruments of ratification on behalf of seven Governments including those Governments which the Conference deems essential. As for the others, the Convention shall come into force immediately on deposit.

Prof. Siedlecki (Poland), without suggesting an amendment, would have had the coming into force depend on the ratification by six Governments, whichever they were.

The German delegation (Dr. Willer and Dr. Weber) opposed all modification of the agreed-on text; if it were modified they could not sign the

Convention. They alleged that the proposed amendments were futile because no Government would like to put into execution a Convention that its rivals might not respect.

The preliminary draft contained the same views as Prof. Siedlecki's text but without assigning any particular number of Governments.

Article 15.

This dealt with the eventual adhesion of a Government which had not signed the Convention. Adhesion was to be possible at any time after its coming into force in accordance with the preceding article and the formalities there laid down, and immediately after these had been performed instead of three months later, as the preliminary draft had stipulated. It was to be presumed that the Government which had decided on adhesion would have done all that was necessary in view of this.

Article 16.

This foresees possible denunciations of the Convention. The text modifies the preliminary draft by fixing the period after which the Convention might be denounced at three years instead of five. The final text added that the denunciation should take effect in respect of the Government by which it is made. This insertion was added to make it perfectly clear that a Government's denunciation did not put an end to the Convention.

The German text was accepted as official alongside of the English and French ones.

Appendices.

Appendix I: Convention for the Regulation of the Meshes of Fishing Nets and the Size Limits for Fish.

THE Governments of Belgium, Denmark, Germany, the United Kingdom of Great Britain and Northern Ireland, Iceland, the Irish Free State, the Netherlands, Norway, Poland and Sweden, desiring to conclude a Convention for the Regulation of the Meshes of Fishing Nets and the Size Limits for Fish, have agreed as follows:—

ARTICLE 1.

The Contracting Governments will take, in their territories to which the present Convention applies, appropriate measures to ensure the application of the provisions of the present Convention and the punishment of infractions of the said provisions.

ARTICLE 2.

The vessels to which the present Convention applies shall be the fishing vessels and boats, as defined in Annex V, registered or owned in the territories to which the Convention applies.

ARTICLE 3.

Prosecutions for infractions against or contraventions of the present Convention shall be instituted by or in the name of the State or of a Department of State.

ARTICLE 4.

The present Convention applies to the fisheries of the North Atlantic and dependent seas as defined in Annex I, excluding the waters specified in Annex II.

Articles 5 and 6 shall not, however, apply to waters in which any Contracting Government has exclusive rights of fishing.

ARTICLE 5.

It is forbidden to carry on board any fishing vessel or boat, or to use, any trawl, seine or other net towed or hauled at or near the bottom of the sea having in any part of it meshes of less dimension than those specified in Annex III.

Such nets having meshes of less dimension than those specified in Annex III may, however, be carried on and used by fishing vessels or boats fishing for mackerel, clupeoid fishes, eels, great weevers (Trachinus draco), shrimps, prawns, Nephrops or molluscs. The Contracting Governments undertake to secure that nets to which this exception applies are not used for the purpose of fishing for fish of other kinds than those to which this paragraph applies.

ARTICLE 6.

It is forbidden to use any device by means of which the mesh of any part of the net is obstructed or otherwise in effect diminished.

ARTICLE 7.

It is forbidden in the territories to which the present Convention applies to land, sell, or expose or offer for sale, any sea fish of the descriptions set forth in Annex IV of less sizes than the sizes prescribed therein for each fish.

The Contracting Governments will make and enforce regulations so that the provisions of this article shall not be evaded in any case where the fish in question have had their heads or any other part removed.

ARTICLE 8.

It is forbidden to retain on board any fishing vessel or boat any sea fish of the descriptions set forth in Annex IV of less sizes than the size prescribed therein for each fish. All such fish must be returned immediately to the sea. Such fish may, however, be retained on board for the purpose of transplantation to other fishing grounds, and the Contracting Governments will make rules governing the retention of fish on board fishing vessels and boats for this purpose.

ARTICLE 9.

The Contracting Governments will make and enforce regulations governing the use in their fishing vessels and boats of fishing instruments for the capture of mackerel, clupeoid fishes, eels, great weevers (Trachinus draco), shrimps, prawns, Nephrops or molluscs so that any fish of the descriptions mentioned in Annex IV of less size than the minimum sizes prescribed therein which may be captured by such instruments shall, so far as is reasonably practicable, be returned to the sea immediately after capture.

ARTICLE 10.

The present Convention does not apply to fishing operations conducted for the purpose of scientific

investigations, or to fish taken in the course of such operations, except that fish so taken shall not be sold, or exposed or offered for sale, unless they comply with the provisions of Article 7 of the Convention and of Annex IV.

ARTICLE 11.

The Contracting Governments undertake to set up a permanent Commission, to which each of them will appoint one delegate.

It shall be the duty of this Commission to consider whether the provisions of the present Convention should be extended or altered. For this purpose the Commission shall consult the International Council for the Exploration of the Sea, and shall have regard to any advice tendered by the Council.

The Government of the United Kingdom of Great Britain and Northern Ireland will call a meeting of this Commission within one year from the coming into force of the Convention, and at least once yearly thereafter.

The Government of the United Kingdom of Great Britain and Northern Ireland will communicate the agenda for each meeting to all other Contracting Governments not less than one month before the date of each meeting.

Reports of the proceedings of the Commission shall be transmitted by the President of the Commission to the Government of the United Kingdom, which will in turn communicate them to all the Governments which have signed or acceded to the Convention.

The Contracting Governments undertake to give effect, on the date stated in the report, to any recommendation of the Commission for the extension or alteration of the present Convention for which every delegate to the Commission shall have voted without reservation.

The Commission shall at its first meeting elect a President to serve for one year, and then draw up for itself rules to govern its proceedings. Such rules may be altered or amended from time to time by a majority vote of the whole Commission. In the case of an even division of votes on any such matter the President shall have a casting vote.

ARTICLE 12.

A Contracting Government may, at the time of signature, ratification, accession or thereafter, by a declaration in writing addressed to the Government of the United Kingdom of Great Britain and Northern Ireland, declare its desire that the present Convention shall apply to all or any of its colonies, overseas territories, protectorates or territories under suzerainty or mandate, and the present Convention shall apply to all the territories named in such declaration, and to fishing vessels and boats registered or owned therein three months after the receipt of the declaration by the Government of the United Kingdom. In the absence of such a declaration, the Convention shall not apply to any such territory.

A Contracting Government may at any time, by a notification in writing addressed to the Government of the United Kingdom, express its desire that the present Convention shall cease to apply to all or any of its colonies, overseas territories, protectorates or territories under suzerainty or mandate to which the present Convention shall have been made applicable under the provisions of the preceding paragraph, and the Convention shall cease to apply to the territories named in the notification and to fishing vessels and boats registered or owned therein three months after the receipt of the notification by the Government of the United Kingdom.

The Government of the United Kingdom will inform all the Governments which have signed or acceded to the present Convention of any declaration or notification received under the two preceding paragraphs, stating in each case the date from which the present Convention has become or will cease to be applicable to the territory or territories specified in the declaration or notification, as the case may be.

ARTICLE 13.

The present Convention shall be ratified. The instruments of ratification shall be deposited in the archives of the Government of the United Kingdom of Great Britain and Northern Ireland, which will notify all the Governments which have signed or acceded to the present Convention of all instruments of ratification deposited and the date of their deposit.

ARTICLE 14.

The present Convention shall come into force three months after the deposit of instruments of ratification by all the Governments which have signed the Convention.

ARTICLE 15.

Any Government (other than the Government of a territory to which Article 12 applies) which has not signed the present Convention may accede thereto at any time after it has come into force in accordance with Article 14. Accession shall be effected by means of a notification in writing addressed to the Government of the United Kingdom of Great Britain and Northern Ireland, and shall take effect immediately after the date of its receipt.

The Government of the United Kingdom will inform all the Governments which have signed or acceded to the present Convention of all accessions received and the date of their receipt.

ARTICLE 16.

After the expiration of three years from the date of its coming into force in accordance with Article 14, the present Convention may be denounced by means of a notification in writing addressed to the Government of the United Kingdom of Great Britain

and Northern Ireland. The denunciation shall take effect in respect of the Government by which it is made three months after the date of its receipt, and will be notified to the Contracting Governments by the Government of the United Kingdom.

In witness whereof the undersigned, duly authorised thereto, have signed the present Convention in a single copy, which shall be deposited in the archives of the Government of the United Kingdom of Great Britain and Northern Ireland.

Certified copies of the Convention shall be communicated to the signatory and acceding Governments.

Done in London the 23rd day of March, 1937, in the English, French and German languages, all three texts being of equal validity.

For the Government of Belgium	H. BAELS. G. GILSON.
For the Government of Denmark	P. F. ERICHSEN.
For the Government of Germany	ERNST WOERMANN. ALFRED WILLER.
For the Government of the United Kingdom of Great Britain and Northern Ireland	HENRY G. MAURICE. GEO. HOGARTH.
For the Government of Iceland	SVEINN BJORNSSON. ARNI FRIDRIKSSON
For the Government of the Irish Free State	G. P. FARRAN.
For the Government of the Netherlands	W. J. JANSSENS. J. J. TESCH.
For the Government of Norway	JOHAN HJORT. JOHANNES SELLAG.
For the Government of Poland	Profr. MICHAL SIEDLECKI.
For the Government of Sweden	K. A. ANDERSSON.

ANNEX I.

Definition of the North Atlantic and Dependent Seas.

The expression "North Atlantic and dependent seas" means, for the purpose of this Convention, the Atlantic Ocean north of the Equator, so much of the Arctic Ocean as lies between 80° west longitude and 80° east longitude, and their dependent seas.

ANNEX II.

The waters excluded from the operation of the Convention are:—

(*a*) The Mediterranean Sea.

(*b*) The Baltic Sea and Belts lying to the south and east of lines drawn from Hasenore Head to Gniben Point, from Korshage to Spodsbierg and from Gilbierg Head to The Kullen.

ANNEX III.

(*a*) In the waters which are both north of 66° N. latitude and east of the meridian of Greenwich, a minimum size of mesh such that when the mesh is stretched diagonally lengthwise of the net, a flat gauge 105 millimetres broad and 2 millimetres thick shall pass through it easily when the net is wet.

(*b*) In all other waters to which the present Convention applies, the minimum size of mesh shall be such that when the mesh is stretched diagonally lengthwise of the net, a flat gauge 70 mm. broad and 2 mm. thick shall pass through it easily when the net is wet.

ANNEX IV.

The fish to which Articles 7 and 8 of the present Convention apply and the sizes below which such fish may not be landed, carried on board or sold, are as follows:—

Fish.	*Size Limit for Whole Fish measured from tip of snout to extreme end of tail fin.* *Cm.*
Cod (*Gadus callarias*)	24
Haddock (*Gadus aeglefinus*)	24
Hake (*Merluccius merluccius*)	30
Plaice (*Pleuronectes platessa*)	23
Witches (*Glyptocephalus cynoglossus*)	23
Lemon soles (*Microstomus kitt*)	23
Soles (*Solea solea*)	21
Turbot (*Scophthalmus maximus*)	25
Brill (*Scophthalmus rhombus*)	25
Megrims (*Lepidorhombus whiff*)	23

ANNEX V.

Definition of Fishing Vessel or Boat.

"Fishing vessel or boat" means any vessel or boat employed for fishing for sea fish or for the treatment of sea fish, and any vessel or boat used partly or wholly for the purpose of the transport of sea fish.

Appendix II: Declaration by the French Delegation.

The French delegation, acting in conformity with the instructions which it has received from the Government of the French Republic, has the honour to make the following declarations:

(1) The French delegation is in agreement with the whole of the delegations participating in the Conference in recognising the indisputable usefulness of the measures which must be taken internationally with a view to fixing the dimensions of the meshes of nets towed at the bottom of the sea and the minimum marketable sizes of edible fish in order to provide an effective remedy for the impoverishment of the fishing grounds.

(2) The French delegation stresses the fact that, immediately after the recommendations made by the International Council for the Exploration of the Sea at Copenhagen in 1934, provisions of a statutory nature were examined by the Higher Council of Sea Fisheries in 1935 and put into legal effect by the decree of the 1st September, 1936, and are already being strictly enforced. These measures, which apply both to deep sea fisheries and coastal fisheries, represent a considerable effort on the part of the French Government and on the part of those professionally engaged in the fishing industries to comply with the desires expressed by the International Council.

(3) Before being able to realise by way of statutory provisions all the recommendations put forward by the International Council, the French Government believes that it is necessary to allow a period to elapse, during which they shall continue to be applied, sufficiently long to prove the effectiveness of their provisions.

(4) In these circumstances the French delegation, being desirous to cause no obstacle to agreements which might and should result from the present Conference, decides, in order that the other delegations may be given full liberty to conclude these agreements, to refrain from signing a Convention which their Government could not immediately put into force. The delegation again wishes to emphasise that this abstention must not be regarded as an unfriendly gesture, but indeed, on the contrary, as the only means of effectively assisting in the conclusion of a general agreement to which it hopes its Government will subsequently accede.

(5) It wishes to stress the fact that since the Conference of November, 1936, important modifications have already been made to the reservation set forth at the time of that Conference, and insists upon the fact that, although not adhering to the Convention, statutory measures will be taken within a short period to fix for the meshes of trawls used in deep sea fisheries a dimension in agreement with the conclusions of the present Conference.

London, 19th March, 1937.

(Signed)
Ed. Le Danois. M. Peyréga. — — Delegates.

Sarraz-Bournet, de Laurens-Castelet.

Fourmentin-Avisse. Experts.

Appendix III: Conclusions presented to the Conference, November 27th, 1936.

1. The recommendations of the Conference refer to the fisheries of the North Atlantic and dependent seas, excluding American waters south of 64° of North latitude, the Mediterranean and the Baltic.

2. The Conference agreed unanimously that the meshes of trawl and seine nets and of other similar nets towed at the bottom of the sea and used for the capture of fish other than pelagic fish, eels, shrimps, prawns and molluscs should be regulated by International Convention.

3. The Conference agreed unanimously that size limits should be imposed by Convention below which fish of the following kinds —

Cod	*Gadus callarias*
Haddock	*Gadus aeglefinus*
Whiting	*Gadus merlangus*
Hake	*Merluccius merluccius*
Plaice	*Pleuronectes platessa*
Dabs	*Limanda limanda*
Witches	*Glyptocephalus cynoglossus*
Lemon Soles	*Microstomus kitt*
Soles	*Solea solea*
Halibut	*Hippoglossus hippoglossus*
Turbot	*Scophthalmus Maximus*
Brill	*Scophthalmus rhombus*
Megrims	*Lepidorhumbus whiff*

should be neither landed nor sold.

4. The Conference agreed unanimously that it should be provided that fish below the prescribed limits of size should not be retained on board any fishing vessel except for the purpose of transplantation or for scientific purposes.

5. All the delegations except that of France agreed to a minimum size of mesh such that, taken over an average of a sufficient number of meshes when the net is stretched diagonally lengthwise of the net, a flat gauge 70 millimetres broad and 2 millimetres thick shall pass through it easily when the net is wet. This regulation should apply to all parts of all nets and not to the cod-end only.

This regulation should be deemed to prohibit the use of any device by which in effect the mesh of any part of the net is diminished.

6. It was agreed that the regulation of mesh should not apply to the waters in which the nationals of the contracting parties, or some of them, enjoy in International Law or by virtue of any Convention the exclusive right of fishing.

The Danish delegation wished that the Skagerak and Kattegat should also be excluded from the operation of the regulation of the mesh.

7. The Conference further unanimously recommends, for the consideration of the Governments concerned, the enforcement of a mesh of 10·5 centimetres diagonal, measured similarly to the minimum mesh specified in paragraph 5, in the area North of 66° of North latitude and East of the Meridian of Greenwich.

The Conference is also of opinion that the Governments should consider whether it is desirable to enforce a similar mesh, namely a mesh of 10·5 centimetres diagonal, in some other fishing regions outside the waters of the European Continental Shelf.

8. With regard to the fishes named in paragraph 3 the following size limits are recommended by the majority of the delegations as indicated hereunder:

Fish.	Size Limit.	Agree.	Reject.	Reserve Consideration.
1. Cod	30 cm.	Belgium Denmark France Norway Poland Sweden	—	Finland Germany Gr. Brit. Holland Irish F. S. Portugal
2. Haddock	24 cm.	All	—	—
3. Whiting	24 cm.	Belgium Denmark Finland Germany Gr. Brit. Irish F. S. Norway Poland Portugal Sweden	France 18 cm. Holland 18 cm.	—
4. Hake	33 cm.	Belgium Denmark Finland Germany Gr. Brit. Irish F. S. Norway Poland Sweden	France 23 cm. Holland 23 cm. Portugal	—

Fish.	Size Limit.	Agree.	Reject.	Reserve Consideration.
5. Plaice	23 cm.	Belgium Denmark Finland Germany Gr. Brit. Irish F. S. Norway Poland Portugal Sweden	France 18 cm.	Holland
6. Dabs	25 cm.	Belgium Denmark Finland Gr. Brit. Irish F. S. Norway Poland Sweden	France 18 cm. Germany Holland 18—20 cm.	Portugal 21—22 cm.
7. Witches	23 cm.	Denmark Germany Gr. Brit. Holland Irish F. S. Norway Poland Sweden	—	Belgium Finland France Portugal
8. Lemon Soles	23 cm.	Denmark Germany Gr. Brit. Holland Irish F. S. Norway Poland Sweden	—	Belgium Finland France Portugal
9. Soles	23 cm.	Belgium Denmark Germany Gr. Brit. Irish F. S. Norway Poland Sweden	France 18 cm. Holland 18 cm.	Finland Portugal
10. Halibut	70 cm.	France	—	All remaining Delegations
11. Turbot	25 cm.	All	—	—
12. Brill	25 cm.	All	—	—
13. Megrims	23 cm.	Belgium Denmark Germany Gr. Brit. Holland Irish F. S. Norway Poland Sweden	France 18 cm.	Portugal

9. It is understood that in the case of shrimp and prawn fisheries a certain destruction of small fish is unavoidable. Measures should, however, be taken to reduce this destruction to the lowest possible limits and to secure the return to the water of all such fish as can be sorted out in a reasonable time.

10. It was agreed that in all cases where size limits were adopted the Governments should make regulations to secure that fish landed with their heads and/or tails off should be so treated that the size limits applicable to the whole fish could not be evaded.

11. Although the Conference has failed to reach unanimity it is of opinion that the degree of agreement reached is such that the Governments should be able in the near future to frame a Convention acceptable to all. In any such Convention it would be desirable to include provision for the appointment of a Committee of Revision which should meet from time to time to take under consideration the initial minimum measurements both as regards mesh and as regards fish, with a view to their extension in the light of experience, and further to consider the extension of the protection given by the Convention to other fishes.

12. The Conference further recommends that the International Council for the Exploration of the Sea should be requested to study and to report upon the results achieved by any Convention of this character which may be made, and further to advise the participating Governments both as to the extension of the limits laid down by any Convention and as to the inclusion in it of fish for the time being excluded.

13. The proceedings of the Conference and of its Committees are recorded in reports copies of which, after confirmation by the respective Delegations, will be transmitted to the Governments represented.

Appendix IV. List of Reports and Papers which have served as Documentation to the International Convention.

Rapports et Procès-Verbaux des Réunions.

Vol. LXV, 1930. Fluctuations in the Abundance of the various Year-Classes of Fishes.

Johan Hjort: Introductory Address.

Oscar Sund: The Renewal of a Fish Population studied by Means of Measurement of Commercial Catches. Example: The Arcto-Norwegian Cod Stock.

D'Arcy W. Thompson: On Fluctuations in the Abundance of Cod.

Erik M. Poulsen: On the Fluctuations in the Abundance of Cod Fry in the Kattegat and the Belt Sea and causes of the same.

Gunnar Rollefsen: Observations on Cod Eggs.

Harold Thomsen: Fluctuations in the North Sea Haddock Stock.

Gérard Belloc: Note sur le Comportement du Merlu (*Merlucius merluccius* L.) pendant la première Période de Croissance.

A. Bückmann: Fluktuationen im Seezungenbestande der Deutschen Bucht.

D. E. Thursby-Pelham: Fluctuations in the Age Composition of the Plaice Stock in the Southern North Sea during the Period 1923 to 1928.

A. C. Johansen: On a correlation between a yearly catch of Herring in the Sound and the abundance of Herring Larvae in autumn.

Fernando de Buen: Fluctuations de la *Sardina pilchardus* (Walbaum) dans les côtes Océaniques.

Einar Lea: Mortality in the Tribe of Norwegian Herring.

K. A. Andersson: Fluctuations in the Abundance in the Stock of Herring in the Baltic and the Sound.

G. P. Farran: Fluctuations in the Stock of Herrings on the North Coast of Donegal.

W. C. Hodgson: Fluctuations in the Herrings of the Southern North Sea.

H. Lissner: Fluktuationen in der deutschen Trawlheringsfischerei.

J. J. Tesch: Year-classes of Herring in the Southern North Sea in the Winters of 1927—1928 and 1928—1929.

Jean le Gall: Statistiques biologiques et considérations sur la population harenguière de la Manche Orientale.

Paul Bjerkan: Fluctuations in the Stock of young Sprat off the West Coast of Norway and its Relation to the Sprat Population as a Whole.

T. H. Järvi: On the Fluctuations in Abundance exhibited by the Stock of Lake Herring (*Coregonus albula*) in Lake Keitele, Finland.

Vol. LXVIII, 1930. Fluctuations in the Abundance of the various Year-Classes of Food Fishes.

Michael Graham: Notes for Discussion of the Fluctuations in Abundance of Year-classes of Cod (*Gadus callarias* L.) in European Waters.

Erik M. Poulsen: Investigations of Fluctuations in the Cod Stock in Danish Waters.

Harold Thompson: On the Possibility of effecting and utilizing accurate Estimates of Haddock Fluctuations.

Adolf Bückmann: Die Erforschung der Fluktuationserscheinungen bei der Scholle (*Pleuronectes platessa* L.).

Einar Lea: Fluctuations in the Stock of Fish. Herring.

Paul Bjerkan: Methods of Investigation into the Fluctuations in Sprat Stocks.

Jean le Gall: L'état actuel de la notion de "Races" chez la Sardine.

Vol. LXXX, 1932. The Effect upon the Stock of the Capture of Undersized Fish.

E. Ehrenbaum: Der Fang jugendlicher Heringe in seinem Einfluss auf die Heringsbestände.

Erich Fischer: Die Wirkung des Fanges untermassiger Fische auf den Bestand.

Alexander Bowman: The Effect on the Stock of the Capture of Undersized Fish. The Haddock Population of the North Sea Plateau.

Aage J. C. Jensen: The Effect of the Plaice Fishery on the Stock of Undersized Plaice and its Influence on the Yield of the Plaice Fishery in the North Sea.
H. Blegvad: The Effect on the Stock of the Capture of Undersized Plaice in Danish Waters inside the Skaw.
G. Gilson: Destruction of Young Fish on the Continental Coast.
Adolf Bückmann: Die Frage nach der Zweckmässigkeit des Schutzes untermassiger Fische und die Voraussetzungen für ihre Beantwortung.
E. S. Russell: Is the Destruction of Undersized Fish by Trawling Prejudicial to the Stock?
Johan Hjort: Remarks on the Fluctuations in Number and Growth in Marine Populations.

Vol. XC, 1934. Size-Limits for Fish and Regulations of the Meshes of Fishing Nets.
Henry G. Maurice: Introductory Note.
Proceedings: 1st and 2nd Sitting — Conclusions (in English, French and German).
E. S. Russell: Size Limits and Mesh Regulations for Sea Fish with 4 Appendices:
A: Summary of existing Regulations (1933) regarding Size Limits and Mesh Restrictions for Fish taken in the Sea or in Brackish Water (Revised to May 1934).
B: F. M. Davis: Report on the Result of Experiments with Savings Gear.
C: — Mesh Experiment indicating that Small Fish escape while the trawl is being towed.
D: — Preliminary Note on a Commercial Mesh Experiment.
A. Bückmann: Über ein Mindestmass für die Seezunge der Nordsee.
Thor Iversen: Some Remarks on Mesh Width and its Influence on Young Fish.
Aage J. C. Jensen: Contribution to an Investigation into the most profitable Size-Limit for Plaice in the North Sea.
R. S. Clark: Scottish Seine Net Investigations.
K. A. Andersson: Experiments with Trawls having different Meshes in the Cod-End.

Vol. CI, 3e pte., 1936. Comparative Studies of the Fluctuations in the Stocks of Fish in the Seas of North and Western Europe.
Reports of the Proceedings of the Special Biological Meeting held on May 11th, 1936, at Copenhagen.
Oscar Sund: The Fluctuations in the European Stocks of Cod (with a Note on the Fluctuations in the North-Western Area by Dr. Å. V. Tåning).
Robert S. Clark: Age Composition of Haddock in European Waters.
Jean le Gall: Hareng. Sur l'Abondance relative des "Classes Annuelles" dans les différentes concentrations de Harengs de l'Atlantique Nord-Est.
Jean le Gall: Le Tassergal ou Blue Fish (*Pomatomus saltatrix* Lacepede = *Temnodon saltator* Linné).
A. Ramalho: Abondance Relative des Classes Annuelles de Maquereau.
P. Jespersen: Fluctuations in Year-Classes of Halibut.
A. Bückmann: Scholle (*Pleuronectes platessa*). Die relative Stärke der einzelnen Jahrgänge in verschiedenen Meeresteilen.
C. F. Hickling: Fluctuations in Year-Classes of Hake (*Merlucius merluccius*, Linn.).
M. Siedlecki: Fluctuations in the Number of Individuals belonging to different Age-Groups in the Catches of European Salmon (*Salmo salar* L.).

Further Publications in respect of Diminution of Stocks of Fish.

Rapports et Procès-Verbaux des Réunions.

Vol. XVII, 1913.
Fr. Heincke: I. Schollenfischerei und Schonmassregeln.

Vol. XLVIII, 1928. Report of the Transition Area and Baltic Area Committees concerning the Question of Protection of Plaice, Salmon and Sea-Trout in the Belt Sea and the Baltic.

Vol. LII, 1928. Report of the Committee appointed by the Council to consider the Question of the Closure of the Moray Firth to Trawling.

Vol. XCI, 1934. Report of the Meeting of Salmon and Trout Experts in Poland.

Vol. XCVI, 1936. Laws and Regulations in Summary concerning Salmon and Trout Fisheries.

Appendix V. List of Delegations — Delegates and Experts.

Belgium:	M. le Gouverneur H. Baels	Delegate
	M. le Professeur Gustave Gilson	Delegate
Denmark:	Mr. P. E. Erichsen	Delegate
	Count Knuth	Delegate
	Dr. Å. Vedel Tåning	Expert
Finland:	Mr. Ragnar Smedslund	Delegate
France:	M. le Dr. Edouard le Danois	Delegate
	M. M. Peyréga	Delegate
	M. Sarraz-Bournet	Expert
	M. Fourmentin-Avisse	Expert
	M. Laurens Castelet	Expert
Germany:	Herr Gesandter Dr. Ernst Woermann (represented by Dr. T. W. W. Weber)	Delegate
	Oberregierungsrat Professor Dr. Alfred Willer	Delegate
	Dr. E. Fischer	Expert
Great Britain:	Mr. H. G. Maurice, C. B.	Delegate
	Mr. Geo. Hogarth	Delegate
	Dr. E. S. Russell, O. B. E.	Expert
	Dr. R. S. Clark	Expert
	Mr. F. M. Davis	Expert
	Mr. M. Graham	Expert
	Miss D. E. Thursby-Pelham	Expert
	Mr. J. W. Lown	Representing the British Trawlers' Federation
	Dr. J. Travis Jenkins	Representing the Association of Sea Fisheries Committees of England and Wales
Iceland:	Mr. Sveinn Björnsson	Delegate
	Mr. Arni Fridriksson	Expert
Irish Free State:	Mr. G. P. Farran	Delegate
Latvia:	Mr. A. Zolmanis	Delegate
Netherlands:	Mr. W. J. Janssens	Delegate
	Dr. J. J. Tesch	Delegate
Norway:	Professor Dr. Johan Hjort	Delegate
	Mr. J. Sellag	Delegate
	Captain Thor Iversen	Expert
Poland:	Professor Dr. M. Siedlecki	Delegate
Portugal:	Senhor Luiz Ferreira de Castro	Delegate
Sweden:	Dr. K. A. Andersson	Delegate
	Mr. S. Corneliusson	Expert
	Consul Fritz Carl Stackelberg	Advisory Expert

CONSEIL PERMANENT INTERNATIONAL POUR
L'EXPLORATION DE LA MER
CHARLOTTENLUND SLOT. — DANEMARK

RAPPORTS
ET
PROCÈS-VERBAUX DES RÉUNIONS

VOLUME CXVI

1ÈRE PARTIE
PROCÈS-VERBAUX
(OCTOBRE — 1945)

2ÈME PARTIE
RAPPORT ADMINISTRATIF
(1942—43, 1943—44 ET 1944—45)

EN COMMISSION CHEZ
ANDR. FRED. HØST & FILS
COPENHAGUE

Prix: 6.00 Kr.

Mars 1946.

Copenhague — Imprimerie Bianco Luno A/S